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Table of Contents.

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ORIGINAL ARTICLES—	Page.	ABSTRACTS FROM MEDICAL LITERATURE—	Page.
The Bancroft Memorial Lecture—The Rickettsial Diseases in Australia, by F. M. Burnet, M.D., Ph.D., F.R.S.	129	Radiology	152
Guerrilla Surgery, by Eric Goulston	134	Physical Therapy	153
Notes on Skin Infections: Darwin, by Alan Frost 136		BRITISH MEDICAL ASSOCIATION NEWS—	
Neurotic Casualties in the Field, by Harold R. Love, M.B., B.S.	137	Scientific	154
A Comparison of Agglutinin Content of Rabbit's Serum After Injection of Liquid and Dried Serum of Rabbits Immunized with Human Group A Cells, by Rachel Jakobowicz, Marjorie Bick and Lucy Bryce	143	SPECIAL CORRESPONDENCE—	
REPORTS OF CASES—		New Zealand Letter	155
Embolia Cutis Bismuthica: An Untoward Accident following the Intramuscular Administration of Bismuth Salicylate in Oil, by F. Goldschlag	144	CORRESPONDENCE—	
A Case of Pick's Cerebral Atrophy, by K. F. Edwards and Charles Swan	145	The War, Quinine and the Medical Profession in Australia	156
REVIEWS—		NAVAL, MILITARY AND AIR FORCE—	
The X-Ray Treatment of Infections	147	Appointments	156
Anæsthesia at Sea	148	Casualties	158
A Text-Book of Pathology	148	MEDICAL PRACTICE—	
LEADING ARTICLES—		Protection of Practices Schemes	158
Food Shortage and Child Health	149	OBITUARY—	
CURRENT COMMENT—		Ralph Worrall	158
Prognosis of Mental Instability under Service Conditions	150	Reginald William Harrison Maffey	159
Rheumatic Diseases under War Conditions	151	Gregory Sprott	160
		NOMINATIONS AND ELECTIONS	160
		BOOKS RECEIVED	160
		DIARY FOR THE MONTH	160
		MEDICAL APPOINTMENTS: IMPORTANT NOTICE	160
		EDITORIAL NOTICES	160

The Bancroft Memorial Lecture.¹

THE RICKETTSIAL DISEASES IN AUSTRALIA.

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This lecture was founded to honour the memory of Dr. Joseph Bancroft. It is now nearly fifty years since Bancroft's death, and there are probably few remaining who knew him personally. His name is familiar to every medical man and student in the form of the specific name of *Filaria bancrofti*, and perhaps a few of these know that Bancroft's discovery was not of the micro-filarial form that haunts the blood stream, but of the adult sexual form. The first report of the adult filaria was contained in a letter from Bancroft to Cobbold which the latter published in *The Lancet* of July 14, 1877. The contents of Bancroft's letter were as follows:

I have laboured very hard to find the parental form of the parasite and am glad to tell you that I have now obtained five specimens of the worm which are waiting to be forwarded by a trustworthy messenger. . . . The worm is about the thickness of a human hair and is from three to four inches long. By two loops from the centre of its body it emits the filarise described by Carter in immense numbers.

My first specimen I got on Dec. 21st, 1876 in a lymphatic abscess of the arm. This was dead. Four others I obtained alive from a hydrocele of the spermatic cord having caught them in the eye of a peculiar trocar I use for tapping. These I kept alive for a day and separated them from each other with great difficulty.

¹ Read at a meeting of the Queensland Branch of the British Medical Association on June 5, 1942.

Cobbold announced the name *Filaria bancrofti* in this letter, and he described the specimens sent to him by Bancroft in *The Lancet* of October 6, 1877, at page 495.

As far as the world of medical science is concerned, that is Bancroft's only contribution—a single brick, but an important one, to be built into the foundations of the science of parasitology. Like so many once exciting discoveries and ideas, the life history of *Filaria bancrofti* is now a mere matter of dull fact to be found in every text-book—an anonymous discovery, for Bancroft and the other pioneers who pieced it together have been dead this many a year.

There was, of course, more to Bancroft than his one remembered discovery. From the rather slender collection of obituary notices, reminiscences and so forth dealing with his life, one gains the picture of a lovable, meddlesome man, interested in everything, breeding new varieties of wheat and grapes, cultivating oysters, tapping hydroceles with a peculiar trocar no doubt of his own invention, and living with a zest. He was in no sense a genius; but to such a man with his twin interests of medicine and natural history and his driving enthusiasm, the fortunate chance was a thing to be seized and exploited.

I have chosen as the theme for this lecture rickettsial diseases as they occur or have occurred in Australia. I feel that the story of these diseases would be one after the heart of such a man as Bancroft. As each of them has been elucidated—typhus fever, Rocky Mountain spotted fever, scrub typhus and so on—something fresh has always emerged to delight the amateur of natural history or the epidemiologist with a special interest in the interaction of human and animal diseases. There is, too, a real human interest to be found in these diseases and in the story of their investigation and partial conquest. Success, such as it is, has been gained only by clear-headed observation, careful experiment and hard thinking in a field that is probably the most physically dangerous of any in the sphere of medical research.

The Evolution of the Rickettsiae.

I am not a practising physician, and my outlook on infectious disease is rather a long way removed from that of the physician, who must necessarily be concerned primarily with his patient and with the damage caused to his patient's body by the invading microorganism. As a biologist I am more concerned with problems such as these: How has the parasitic habit of this microorganism been evolved? How does the microorganism survive in Nature? Does it pass directly from patient to patient, or are there intermediate hosts and vectors? Is man as a species necessary for the continued survival of the parasite, or is he merely an accidental host, the normal life and evolution of the parasite being carried on at the expense of other hosts? These questions may sound pedantically academic; but I believe that only by attempting to answer such questions are we likely to reach a satisfactory understanding or a practical control of any infectious disease.

Our first topic then is this: What are the rickettsiae and how have they evolved? As we find them today, the rickettsiae may be defined as small, rod-shaped microorganisms, which are capable of multiplication only within living cells and which are transmitted by some insect vector. In many ways they form a connecting link between bacteria and the filtrable viruses. They are smaller than bacteria, but still large enough to be easily visible with the microscope, and they stain in much the same way as bacteria. They resemble viruses in being quite incapable of growth outside the living susceptible cell. There are, perhaps, some hints that this dependence for nourishment on the living cell is not so absolute as it is for the smaller viruses, and it may turn out that, as in other respects, the metabolism of the rickettsiae is intermediate between the modes of bacteria and those of viruses.

The rickettsiae all seem to be primarily parasites of insects, ticks or mites, and all the human diseases falling in the rickettsial group result from direct or indirect contact with infected arthropods. There is a wide variety of human rickettsial disease; but it is possible to reduce the infections to four main groups, which can be exemplified by classical epidemic typhus, Japanese river fever, Rocky Mountain spotted fever and "Q" fever. These are transmitted respectively by the louse, a mite and two genera of ticks.

The evolution of the rickettsia has been the subject of considerable discussion, and we can give a fairly satisfactory outline of its probable course. It is a general rule that parasitic animals, plants or microorganisms have evolved from free-living forms, strict parasitism usually representing an evolutionary cul-de-sac from which no further advance is possible. As far as can be judged, however, the rickettsiae as we know them represent a secondary evolution from a group of ancient, well-adapted parasites or symbionts.

In the tissues of many insects there are curious cells of unknown function which appear to be crowded with microorganisms. In many aphids, cicadas and other plant-eating insects these microorganisms are large and resemble yeast or some other of the lower fungi. In cockroaches and in most blood-sucking insects the cells contain smaller bodies, which stain like bacteria or rickettsiae. It is doubtful whether any of these bodies have ever been cultivated by ordinary bacteriological methods; but their behaviour and distribution have convinced most observers that they are bacteria which have become completely dependent on an intracellular existence. There is a little evidence that the bacteriocytes (the cells containing these problematical microorganisms) are somewhat damaged by their symbiotic inhabitants; but on the other hand, the symbionts have a complicated life history, being transmitted through the egg and eventually reaching the characteristic cells in the individual of the next insect generation. Their movements and growth during this process appear to be closely coordinated with the various stages of the host's development. This description (following Glaser, 1930) is based essentially on the symbionts of the cockroach. In some of the blood-sucking insects, which because of their importance in human disease have been closely studied, essentially similar

organisms have been observed; these, however, show a definite approach toward the behaviour of the pathogenic rickettsia. In the tsetse fly, for instance, the bacterial symbionts are found in greatly enlarged cells of the mid-intestine; they are liberated occasionally by the breakdown of these cells, and may be found free in the intestinal lumen. In bed bugs and lice and in the sheep-ked (a wingless parasitic fly) there are microorganisms, not apparently responsible for human disease, which are essentially indistinguishable from pathogenic rickettsiae. They are transmitted from one generation to another through the egg. Amongst the pathogenic forms one is certainly and another probably transmissible through the egg.

If we leave the actual facts and venture on an evolutionary interpretation, it must be something like this. The first stage is probably a colonization of the gut of primitive insects by saprophytic bacteria. Bacteria are everywhere in nature, ready to utilize any available source of food material. The food residues in the intestinal tract obviously provide material for bacteria to exploit. Some of the bacterial species which become adapted to life in this environment will probably develop a capacity to gain nutritive material from the living cells lining the gut. They thus become true parasites, capable of actual or potential damage to the host. After many centuries—perhaps after whole geological periods of interaction between host species and the bacterium—a new *modus vivendi* becomes established, with the bacteria tolerated as symbionts within the cells. The equilibrium is, however, intrinsically unstable; the host cell under certain conditions may be disrupted by excessive multiplication of the microorganisms. Their potential pathogenicity may also be called into activity by any other types of living cell with which they chance to make contact. When the insect host develops the habit of living on the blood of a vertebrate, new possibilities of ways of living emerge. More or less accidentally, the microorganism finds that it can "parasitize" the endothelial cells of vertebrate blood vessels, and a new disease is born. The harmless symbiont of the ticks in Bitter Root Valley becomes at the same time the agent of the most uniformly fatal of human diseases—Rocky Mountain spotted fever. It is an interesting commentary on the fact that man is only an accidental host of any of the rickettsiae, to find that all the rickettsial diseases have a basically similar pathology. In some instances the rickettsiae can produce a local skin lesion at the point of inoculation; but otherwise their direct attack is limited to the endothelial cells in direct contact with the blood stream. The portion of the capillary bed most affected varies with the disease—in typhus it is the brain, in Rocky Mountain spotted fever the skin and particularly the scrotum.

Once the rickettsia has broken free from the limitations of its ancient symbiosis with the insect, new interactions can develop with the various arthropod vectors and mammalian hosts that may be involved. Some of these I shall mention later in this talk.

To summarize this discussion of the evolution of the rickettsiae, one can make three propositions: first, that the pathogenic rickettsiae are primarily insect symbionts or semiparasites; secondly, that the involvement of human beings is in most cases a mere biological accident and not a necessary phase in the life history of the rickettsial species; and thirdly, that when a new host (man) is invaded, possibilities of spread by other means than the original arthropod vector may arise, with consequent change in the epidemiological features of the disease.

Epidemic and Endemic Typhus Fever in Australia.

In all probability rickettsial diseases of man made their first appearance on Australian soil when the second fleet of convict ships arrived in Sydney in 1780. Scurvy and dysentery were undoubtedly responsible for much of the sickness in the three ships, and there is no certain evidence of the presence of typhus fever. In the circumstances, however, it is highly probable that typhus played a major part in causing the high mortality which was experienced. Amongst just over 1,000 convicts, 267 died on the voyage and 80 or 90 after their arrival in Sydney (Cumpston and

McCallum, 1926). The first definite statement that disease in the early convict ships was "gaol fever" is found in Governor Hunter's report on the *Hillsborough*, which reached New South Wales in 1789. Apparently conditions ashore were such that typhus failed to spread, and the only Australian epidemic on record is that amongst convicts in Hobart in 1839-1840.

After the days of transportation, typhus appeared occasionally in the crowded ships that brought the gold-seekers in the fifties and sixties. The best known and most serious outbreak was on the emigrant ship *Ticonderoga*, in 1852. There were 814 passengers in a ship of 1,089 tons; of these, 96 died during the voyage and a further 72 in the quarantine station at Portsea.

These epidemics in crowded ships and prisons were manifestations of classical louse-borne typhus. They failed to spread to the civil community, for the simple reason that typhus can spread only when conditions are such that transfer of lice from person to person can readily and frequently occur—in other words, under conditions of mass poverty and uncleanness, which have never yet disfigured Australia.

Despite the absence of classical typhus in Australia, there is a closely related or almost identical disease, endemic typhus, which crops up occasionally in Queensland, South Australia and Western Australia, less frequently in the other States. Clinically, it is on the average somewhat milder but otherwise identical with the classical disease. Like the latter, it produces a positive reaction to the Weil-Felix test, the serum of patients in the later stages of the disease agglutinating *Proteus* strains of the X 19 type. Hone, in 1920, first described cases of this type from Adelaide. They occurred chiefly amongst wheat lumpers, and Hone made two suggestions as to the mode by which the men became infected. He was at first inclined to suspect grain weevils as the source of virus; but later he suggested that the infections might have been derived from mice or rats. As far as I can discover from the literature, this was the first well-based suggestion that typhus could occur as a by-product of some quite different biological system. No experimental work, however, was done in Australia, and credit for the recognition of the true nature of sporadic typhus must go to Dyer and Maxcy, of the United States Public Health Service.

A considerable amount of work has been done since Maxcy recognized the importance of the rat as a reservoir of infection, and we can now give a relatively clear picture of the disease.

Endemic typhus is a result of man's accidental intrusion into that almost equilibrated biological system: rickettsia, rat flea and rat. Endemic typhus in the rat is almost or wholly subclinical, and rickettsial infestation is likewise harmless to the rat flea. The rickettsia is passed from vector to host and back again, neither is any the worse for it, and the three species survive indefinitely. The mode of human infection is still somewhat indefinite. It was formerly thought that the disease was transmitted by the bite of an infected flea; but there is growing evidence that in some cases at least the organisms are inhaled. The rickettsiae are excreted in large numbers by infected fleas, and dry flea faeces are known to remain infective for long periods. Addey has commented on the frequency with which infection occurred among workmen engaged in the demolition of old rat-infested premises—that is, working in conditions under which they would be likely to inhale dust laden with flea excreta.

In discussing the relationship between endemic and epidemic typhus, I must of necessity follow Zinsser—and let me add that if any of you wish to read more about this problem and about a thousand and one other things more or less directly related to typhus fever, then you should read Zinsser's "Rats, Lice and History". The typhus rickettsia according to Zinsser evolved in the rat and its fleas; endemic typhus is the persisting ancestral form of the disease. When accidental infection of human beings with endemic typhus occurs, any lice they may be carrying will become infected. In a poverty-stricken, louse-ridden population one case of rat-type typhus may therefore initiate a small epidemic, spread in the classical

fashion by lice. Such a process can be seen in action in Mexico, and according to Zinsser it is rather likely that the typhus of Eastern Europe arose from sporadic rat typhus during the Hungarian wars of the sixteenth century. By long transfer from man to louse to man the classical European strains have lost their power to follow the rat flea cycle; but they have not yet reached a real *modus vivendi* in the new cycle. The rat flea is unaffected by rickettsial infestation; the louse infected with *Rickettsia prowazeki* dies in about ten days. That in itself makes it almost impossible that the disease should have evolved in the louse-man cycle. It is one of the soundest generalizations about infectious disease that the two species, host and parasitic microorganism, given time and opportunity, tend to reach an equilibrium in which the host is relatively little damaged by the activities of the parasite. Infectious disease is highly fatal only when the normal balance of Nature has been seriously disturbed. The typhus rickettsia is not a natural parasite of the louse, and it multiplies without restraint when once it gains access to the louse intestine. As Zinsser puts it:

If lice can dread, the nightmare of their lives is the fear of some day inhabiting an infected human being. For the host may survive, but the ill starved louse that sticks its haustellum through an infected skin and imbibes the loathsome virus with his nourishment is doomed beyond succour.

Typhus becomes epidemic when human beings crowd together under conditions where it is impossible to wash their bodies or change their clothing, so that lice can pullulate and spread easily from one person to another. Overcrowding, poverty, cold and lack of self-respect are as necessary for the spread of typhus as the rickettsia or the louse. So we find it in the slums and in prisons, in crowded ships and in the wake of war, especially in countries with long cold winters. Only when civilized life was completely broken down would it ever be likely to become important in Australia.

To return to the Australian history of endemic typhus, sporadic cases have occurred in certain areas, particularly Port Adelaide and Fremantle; but the most interesting episode in the story of Australian typhus was the Toowoomba outbreak, which was investigated by Wheatland (1926). This was a relatively large epidemic involving about 200 persons, but the mortality was unusually low, for there were only four deaths. The outbreak was spread over a period of three or four months and was circumstantially related to a plague of mice in the district. Unfortunately no facilities were available for a comprehensive study of the relationship between the mice and the typhus cases, and the interpretation of the outbreak must therefore be largely speculative. The human infections occurred particularly at the time when the mouse plague began to diminish, and with the disappearance of the mice the cases of typhus also ceased to appear.

It is common knowledge that small rodents (mice in Australia) show irregular phases of vast increase in population. The causes of these increases are obscure and I shall not attempt to discuss them. In the present connexion we are concerned with the reasons, not for the increase in population, but for the almost sudden disappearance which characteristically ends the period of over-population. In several instances the cause of the depopulation has been shown to be the epidemic spread of infectious disease, and it is probable that this is almost always the decisive factor. The parasites concerned may vary widely. Amongst the rodents in Central Asia the parasite is commonly the plague bacillus; in England the decrease in vole population has been ascribed once to toxoplasma infection and once to tuberculosis. In general terms, we can say that an overcrowded population is dangerously susceptible to any agent of disease which can spread within it. If the microorganism is responsible for a fatal disease it will soon reduce the population to or below the normal level. Non-fatal diseases will spread just as readily, and in fact the only small investigation of an Australian mouse plague with which I have been concerned showed that the mice were heavily infected with two minor pathogens. There were favus lesions on the skin and chronic joint or lymph node abscesses due to

Streptobacillus moniliformis. Neither condition seemed to interfere much with the general health of the mice. At Toowoomba we must assume that one of the micro-organisms spreading through the excessive mouse population was a strain of the typhus rickettsia. Perhaps it was responsible for the depopulation of the mice; perhaps it was spreading through them in subclinical, invisible fashion; without specific observational data it is impossible to say. Nor can we be sure how the virus passed from mice to men. There are two main possibilities: first, that the mice were infested with some blood-sucking insect or mite which could transfer the disease directly; or secondly, that human infection resulted from the inhalation of infected dust in mouse-infested barns and the like. The full investigation of an occurrence of this sort demands, not only ample laboratory facilities, but also an intimate knowledge of the lives of all the species concerned. The epidemiologist may not only need to know something of the habits of mice and men, but he must also include in his considerations the tastes of ectoparasites and the resistance of rickettsiae to environmental changes. It is particularly in these problems of diseases common to man and animals that a breadth of biological knowledge is necessary for their understanding and control.

The Scrub-Typhus Group of Fevers.

Along the margins of the western Pacific, from Japan through Formosa, Indo-China, Malaya, Sumatra and New Guinea to tropical Queensland, there exists another type of rickettsial disease. In Japan it is called tsutsugamushi; in Malaya and other English-speaking communities it is usually called scrub typhus or "K" typhus. The symptoms are much the same as those of typhus fever proper, except for the frequent occurrence of a primary skin lesion as well as of the general manifestations. Differentiation is in practice made by the agglutination test. Serum from patients who have been ill for more than a week agglutinates Proteus XK strains, but not the standard Proteus X 19; hence the alternative name of "K" typhus. I may mention in passing that the discovery of the strain *Bacillus proteus* K by Kingsbury represents one of the most extraordinary accidents in the history of medical research. After a visit to England, Kingsbury took back to Kuala Lumpur a reputed strain of Proteus X 19. Specimens of serum from some patients with typhus fever in Malaya had been failing to agglutinate the strain of X 19 in current use and were tested against Kingsbury's strain. They agglutinated it well, and soon afterwards it became clear that in Malaya there were two types of typhus fever. That of the towns induced agglutinins against X 19 and was merely the local strain of endemic typhus; typhus of workers in the plantations and the jungle caused the serum to agglutinate Kingsbury's strain, but not Proteus X 19. And I am assured that to this day no one knows how the strain labelled "X 19" in London became the extraordinarily useful but antigenically quite distinct strain XK in Malaya.

Most of the work on scrub typhus has been carried out at Kuala Lumpur, first by Fletcher and Kingsbury, more recently by Lewthwaite and Savour. In Australia the work of Mathew and Heaslip has shown that one form of coastal fever in north Queensland is a disease of this group, and in New Guinea Gunther had done much useful work on the local form of the disease before the outbreak of war in the Pacific.

Scrub typhus is a good example of a human disease in which man merely blunders into a biological system with which he is not essentially concerned. There are still details to be worked out in regard to the biology of scrub typhus in Queensland; but from Heaslip's work it seems certain that the infection is as elsewhere a mite-borne disease. The mite responsible (*Trombicula*) has a wide-spread distribution from Japan to Queensland. There may be other vectors, but the larval form of one species of *Trombicula* is the only one which has yet been definitely implicated. The vertebrate host varies with the region involved. In Japan field mice form the main reservoir, and in Queensland rats and bandicoots.

The mites infest swamp and jungle country, and workers in partially cleared jungle are most frequently infected. The larval mite is very small, and its bite does not penetrate deeply into the skin. The rickettsiae are probably deposited much as they would be if they were inoculated intradermally with a microscopically fine needle. Here in the skin they multiply, producing a characteristic local lesion from which the rickettsiae pass to the general circulation. The lesion takes the form of a papule, which subsequently forms a dark eschar. The regional lymph nodes are enlarged and tender. Both in Queensland and in Malaya cases occur in which no local lesion is found. In all other clinical and serological aspects the fevers are identical with the classical form. It was usual to call the fevers associated with a local eschar tsutsugamushi, and those without such an eschar scrub typhus; but it is now clear that both types are manifestations of the same disease. It is not certain what factor is responsible for this difference. It may be merely the depth to which the infective material is thrust in the skin, and there have been suggestions that another vector, perhaps a tick which penetrates more deeply than the mite, is responsible for the cases without the local lesion.

However, according to Heaslip, the epidemiological evidence is strongly in favour of the idea that the mite *Trombicula deliensis* is the sole means by which the disease is transferred to human beings. A point of considerable interest is that although the serum of a fair proportion of bandicoots from south Queensland contains Proteus XK agglutinins, no human cases have been proven south of Sarina. Heaslip is inclined to think that this is to be related to the fact that *Trombicula deliensis* is a tropical form not found as an ectoparasite of bandicoots in the south.

Tsutsugamushi or scrub typhus then can be described as a disease of mites, perhaps only of the one species. From the mite the rickettsia can be transferred to and can infect several types of rodent and marsupial, and man. What is still required is to know how the larval mites become infected. If it is true that larval mites normally feed on blood only once and after moulting are strictly vegetarian, we must assume that the rickettsia passes from larval mite to nymph and adult and through the egg to the next generation. It may be that such a transfer through the egg is sufficient to ensure the survival of the rickettsia. More likely is it that the vertebrate host plays a secondary rôle in allowing a previously uninfected larval mite to take up the rickettsia. Its blood meal completed, the mite undergoes its metamorphoses, and if it is a female passes on the infection to its eggs and the next generation of larval mites. Transfer of infection from one animal to the next must therefore be separated by the time necessary for a complete cycle of the mite's development. All this, however, is mere deduction; it will be an interesting and difficult task for some future worker to determine the real nature of the association between mite and rickettsia.

"Q" Fever.

There are no examples of the spotted fever group of rickettsial diseases in Australia, so that we can pass to the last group of the human rickettsial diseases—"Q" fever. (I should take coats to Newcastle before daring to discuss the clinical features of "Q" fever before a Brisbane medical audience. As with the other diseases, I shall concentrate on its natural history and epidemiological characters, not on the clinical and pathological features of the human disease.) The existence of what is now known as "Q" fever was recognized seven or eight years ago, when Brisbane practitioners became aware that workers at one of the abattoirs were providing a continuing supply of moderately severe fevers. These cases were sufficiently alike to suggest strongly that they had a common aetiology. The clinical picture was quite undramatic, fever and headache being the dominant symptoms; there were no rash and no localizing signs. The infection involved only workers at the abattoirs; it did not spread to the other inmates of the patients' homes. There was from the beginning an obvious suggestion that

this was an occupational disease, an infection derived presumably from the animals being slaughtered at the abattoirs.

In 1935 Dr. E. H. Derrick undertook an experimental study of the disease. He was successful in transmitting the infection to guinea-pigs and in showing that they responded with a characteristic temperature reaction. Once a guinea-pig had reacted, it was immune to a subsequent reinoculation with the agent. This provided a definite laboratory method for the diagnosis of the disease; but the actual nature of the microorganism could not be established. Although it is now known to be a rickettsial disease, neither Dr. Derrick nor I have ever seen rickettsiae in guinea-pigs inoculated with Australian strains. In 1936 Dr. Derrick suggested that we should investigate the experimental disease at the Walter and Eliza Hall Institute. Miss Mavis Freeman and I succeeded in producing infections in mice as well as in guinea-pigs, and in the livers and spleens of the mice we found large numbers of typical rickettsiae. From these organs purified suspensions of rickettsiae could be prepared, which could be used as a diagnostic agglutinating emulsion. This was our only important contribution to the problem of the epidemiology of "Q" fever; but it supplied a useful weapon for further work in Queensland. The agglutination test provided an easy means of recognizing past infection whether in men or in animals, and greatly simplified the task of tracing the activities of the rickettsia. Dr. Derrick and his collaborators then went on to a splendid series of investigations which elucidated most of the life history of the rickettsia of "Q" fever.

The rickettsia is probably a natural parasite of the tick *Hamaphysalis humerosa*, but it can multiply equally well in at least three other species of tick. In all, the rickettsiae multiply in cells lining the alimentary canal. They are liberated into the lumen, and the tick faeces are highly infectious. *Hamaphysalis* is predominantly an ectoparasite of bandicoots and opossums, and as far as Derrick and Smith's investigations go the bandicoot-*Hamaphysalis* cycle is the important one for the perpetuation of "Q" fever rickettsia. Three strains of the microorganism have been isolated from bandicoots caught in the bush, and many more bandicoots, particularly those from Moreton Island, had "Q" fever agglutinins indicative of past infection. In six instances ticks taken from such bandicoots were proved to contain the specific rickettsia. Bandicoots carry a large number of other species of ectoparasite, but none of these have been found naturally infected with the rickettsia. Recent work, however, has shown that there is another common parasite of the bandicoot which can transmit "Q" fever. This is *Ixodes holocyclus*, the scrub tick, which has a wide range of hosts including cattle, dogs and human beings. In all probability it is this tick which provides the link between the bandicoot-*Hamaphysalis* cycle and the source of infection in the abattoirs.

Although the evidence is still incomplete in places, there can be little doubt that Derrick, Smith and Brown are correct in ascribing the abattoir cases to infection from cattle ticks. They have shown that calves can be experimentally infected with "Q" fever and that the common cattle tick *Boophilus annulatus* can take up the infection from such calves. It has also been shown that faeces from infected ticks of this species will retain their infectivity for months.

The presumptive path followed by the rickettsia from the bandicoot reservoir to the human infections in the Brisbane abattoirs then becomes as follows. *Ixodes* ticks become infected from bandicoots and transfer the infection to cattle. During the brief period in which cattle blood is infective, cattle ticks (*Boophilus*) take up the rickettsia and subsequently excrete it in their faeces. Cattle from infected country districts are sent to the abattoirs, and there dozens of opportunities for the liberation of dust containing dry tick faeces must arise. The great majority of abattoir workers who contract the disease probably do so by inhaling such infective dust. The possibility is, of course, not excluded that the infection may sometimes result from tick bite or by skin contamination with crushed ticks. The distribution of cases, however, speaks

strongly for air-borne infection, workers in all parts of the abattoirs and even casual visitors being included in the list of patients.

Strong support to this view is given by the experience of laboratory workers. Every laboratory in which "Q" fever has been studied has suffered a series of infections among its personnel in circumstances which indicated that the rickettsia entered by the respiratory route. The most striking example of these infections was at the National Institute of Health in Washington. But before I tell that story it is necessary to say something about American "Q" fever.

In 1939 Davis and Cox described a rickettsia which had been obtained by guinea-pig inoculation of a batch of ticks collected in Montana. This had no connexion with any known human disease, but produced distinctive lesions in the guinea-pig, had no immunological relation to the well-known rickettsiae and was more readily filtrable than they were. By a curious coincidence I had sent Dr. R. E. Dyer, of the United States Public Health Service, a strain of "Q" fever, which reached him only a few weeks before he visited Montana and worked for a week or two with Cox on the new Montana strain. A little time later Dyer had an opportunity to investigate an infection in a laboratory worker from whose blood a rickettsia was isolated. This worker may conceivably have been infected either by the Australian "Q" fever strain or by the Montana organism. Appropriate tests gave the wholly unexpected result that all three strains were antigenically identical. Cox and Davis had isolated the "Q" fever rickettsia in America before any human case of the disease had been recognized.

Subsequent study showed that human infections were not uncommon in the western States, particularly in Idaho and Montana, and were associated with tick bite. American "Q" fever is now a well-recognized entity, and the clinical and experimental disease has been extensively studied by members of the United States Public Health Service. At the National Institute of Health at Washington, laboratory work on the subject was in progress during 1939 and 1940. Early in 1940 a number of relatively severe fevers associated with signs of lung consolidation were observed amongst members of the staff. One of the cases was fatal. Investigation of this pneumonitis outbreak showed that it was due to infection with the rickettsia of "Q" fever. It was curious, but significant, that the only department of the institute in which cases did not occur was that in which actual experiments with "Q" fever were going on. If we consider this fact along with other features of the outbreak, we are driven to conclude that the infection was contracted by the inhalation of infective dust. Workers in other parts of the building are not likely to be bitten by infected ectoparasites or to infect a scratched finger from an animal autopsy; but they may well be exposed to dust passing along corridors or lift wells. The primary pneumonitis in itself suggests an inhalation infection, and the absence of secondary cases in the patients' homes shows that the infective material came from some non-human source.

In Melbourne we had a similar experience; nine members of our staff gave evidence of having been infected with "Q" fever at one time or other during the period during which we were studying it. Most of the infections were subclinical and recognizable only by the appearance of serum agglutinins, but three were moderately severe. As in Washington, all these three clinical infections were in persons having no direct association with the "Q" fever work. The only way in which we can account for their infection is by the inhalation of infective dust. In all probability the rickettsiae were liberated into the air while guinea-pigs' temperatures were being taken.

Conclusion.

It would be usual to conclude a dissertation of this sort by discussing what could or should be done to prevent or minimize the diseases in question. But at the present time in Australia such questions hardly arise. The rickettsial diseases taken together probably kill less than twenty persons each year in the whole of Australia, and there are many more important public health dangers to

be coped with in peace time and even more in war time. It is just conceivable that scrub typhus may become of military importance in jungle fighting in north Queensland or in the East Indies; but the other two diseases I have discussed have not even that potential importance.

In the midst of present-day urgencies I cannot avoid feeling apologetic for taking as my subject something with no direct bearing upon the war. Today we are compelled to judge our professional or scientific activities almost wholly from the point of view of their immediate value to the social structure. There is no time for minor activities which are not directly helpful to the prosecution of the war. Almost equally urgent social problems will be presented in the post-war world, and when peace returns society will probably demand that men of knowledge and ability should turn nearly the same effort as in wartime to the pressing problems of a reorganizing community. But I hope that there will be some scope for the study of the less important matters as well. We may admit that the major function of science is to provide the most efficient methods of fulfilling the material needs of society. Nevertheless anyone with the slightest experience of actual scientific work knows that research is not in fact carried out with any such aim. Most scientists forget the problems of society once they are inside the laboratory. They can usually find sufficient fascination in that interplay of curiosity, intellectual activity and manipulation which is research, to make both economic and altruistic motives of only secondary importance. This fascination of scientific work has its own dangers, and there is penetrating comment on scientific activity in Aldous Huxley's "Ways and Means":

... Artistic creation and scientific research are absorbingly delightful occupations possessing moreover a certain special significance in virtue of their relation to truth and beauty. Nevertheless artistic creation and scientific research may be and constantly are used as devices for escaping from the responsibilities of life. They are proclaimed to be ends absolutely good in themselves—ends so admirable that those who pursue them are excused from bothering about anything else. . . .

To many men, scientific work is undoubtedly a means of escape from reality. At the same time it is a legitimate social activity, which if successful may gain both prestige and economic security for the scientist. These two aspects taken together largely account for the fascination which scientific work exerts over a considerable number of men. As long as the intrinsic pleasure of the work is supported by a belief that it has at least some potential value to the community, the social significance of his work is a matter of little concern to the scientist. He can bring the same zest to the socially unimportant task of elucidating an obscure infectious disease as he would to some immensely important practical matter—let us say the development of an effective substitute for quinine.

There is no need to stress the truism that what is a mere academic curiosity one year may be a matter of high social importance a decade later. Science and the human applications of science have been made possible only by the zest with which men have studied what to their own generations were matters of no importance. And so I hope that after the war society will still allow us a certain leisure, in which both professional scientists and men who, like Bancroft, are scientists by temperament, can exercise their talents on things which are not of immediate importance. It is right that the needs of the community should have first call upon scientists; but if science is to remain alive, there must be opportunity in the future both for the man who in his spare time will cultivate some corner of science, whether it be the hybridization of grapes or the local geology, and for the professional worker whose interests lie in fields that for the time being seem to have no social significance.

Acknowledgement.

I am greatly indebted to Dr. E. H. Derrick for permission to include in this lecture some results of his unpublished work on "Q" fever.

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GUERRILLA SURGERY.

By ERIC GOULSTON,

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Australian Imperial Force.

It may be thought that little more than first aid treatment can be offered by medical officers associated with guerrilla forces. However, the experience of the writer, who enjoyed a campaign with the Abyssinian patriots, showed that much more can be achieved despite all the inconveniences of lack of equipment and transport.

An irregular force is composed of bands essentially mobile in character with primitive means of locomotion. It fights a "hit and run" campaign, and its main value lies in harassing the enemy in rough country, where lines of communication are difficult and support from regular forces with their stores and organization is absent. Improvised methods must suffice, and difficulties of water supply, shelter and temporary "hide-outs" must be taken into account. Close cooperation with detachment leaders and the formation of collecting posts in different areas permit of a kind of liaison with forces who have no routine, receive no movement orders and work on their own initiative.

In the Abyssinian campaign a surplus of medical stores and surgical equipment was continually being captured. The rule of travelling light must, however, be observed and the temptation to add accessories resisted.

The roving nature of guerrilla bands, their dispersion, and their difficult lines of communication in primitive and often hostile country, make the early treatment of wounded difficult. On the other hand, in many instances, one is often in the position to furnish immediate treatment.

Four fit and well-trained orderlies constitute a team, as it becomes necessary to leave an orderly with seriously wounded men at various places, and he may not rejoin the main body for some considerable time. These orderlies must be able to give anaesthetics and to assist at operations, and must be proficient at instrument sterilization, surgical nursing and after-care. An orderly may have to accompany the medical officer or to travel alone with fighting patrols according to their size, and he may be absent for several days. Sudden decisions about movement often have to be made, and the knowledge that an experienced orderly can be left in charge is comforting, even though to leave him is inconvenient.

Native bearers are easily trained for rough, improvised work and for stretcher bearing.

The force to which the writer was attached consisted of over 5,000 Abyssinians, eight British soldiers and three native interpreters; the British soldiers were the commanding officer, the medical officer, two signallers, a sergeant and three medical orderlies. For the first month the medical work was carried out at one main base, to which the wounded were conveyed from patrols working in a wide area of countryside. Later, however, the whole force "trekked", and was never in one area for more than a few days. Communications were possible solely by mule or on foot, and it therefore became necessary to leave seriously wounded personnel in villages and farm houses. It was found that, whatever their "patriotic" leanings, the Abyssinian villager always appreciated medical attention given to wounded on either side. They were only too pleased to help with stretcher bearing, with water carrying, with improving accessories or with the provision of food. One's practice and activities become spread over a wide area of countryside. Evacuation of patients to the main base soon became impossible, weeks or even months passing before patients were collected and transported to recognized hospital centres in areas which came under control of regular forces. Follow-up is difficult, and the great efficacy of plaster of Paris becomes apparent in these circumstances.

The Ethiopian is a tough, wiry individual, who appeared resistant to shock. Nevertheless, the incidence of shock was lessened by treating the wounded where they fell and leaving them with a companion under an improvised shelter. As general conditions improved, their location was discovered by "bush wireless", and they were brought in to the main dressing station. These wounded were fed entirely on any foodstuffs available locally. Abyssinia is a first class agricultural country, and is rich in cattle and coffee. There was never a lack of goat's milk or native bread. Blankets and camouflaged shelters appeared miraculously. Anaerobic infections and medical complications were conspicuous by their absence in the Ethiopian, seemingly owing to the lack of cultivation of the land, to the high altitude, and to the native mode of life. As far as could be ascertained, only two cases of anaerobic infection occurred in natives in the whole Abyssinian campaign. Little antiserum was available, and it was kept entirely for British casualties.

The eagerness of the Ethiopian to return to his national pastime of fighting and his desire for loot greatly assisted in his rehabilitation; one was pleasantly surprised to find little muscular wasting in the majority of wounded left by the wayside and not seen until after the fall of Gondar. The foul odour from a plaster-encased limb left for a long time and infested with maggots, means nothing to an Ethiopian.

Anæsthesia was induced by chloroform as a rule; but occasionally "Evipan Sodium" and local infiltration were used. Large amounts of "Evipan Sodium" and syringes were continually being captured, but the ease of administration of chloroform by orderlies made it the anæsthetic agent of choice. The bulkiness of ether, its slow induction period and its after-effects precluded its use.

An X-ray machine or a transfusion outfit constitutes an impossible luxury, and but few accessories can be carried. A list of bare essentials is appended; this equipment was carried on eight mules:

Scalpels.	Gauze.
Artery forceps.	Strapping.
Tissue forceps.	Chloroform.
Scissors.	"Pentothal sodium."
Saw.	A few antiseptics.
Probe.	Morphine.
Retractors.	Sulphapyridine.
Dental forceps.	Saline solution in tubes.
Needles.	"Vaseline" in tubes.
Sutures.	Tourniquet.
Syringes.	Field service cards.
Razor.	Tent.
Thomas's splints.	"Primus" stoves.
Plaster of Paris.	Containers.
Gloves.	Blankets.
Shell dressings.	One drum containing towels.
Wool.	Kerosene.
"Novocain."	Rubber tubing.
Bandages.	"Tamafox" stretchers.

Field medical cards were attached to all patients left by the wayside.

A small captured Italian marquee tent, suitably camouflaged, was carried and was erected whenever needed.

Of all gun-shot wounds, 90% occurred in the limbs, in many cases causing compound fractures particularly in the lower extremity below the knee. Through-and-through wounds of the chest, penetrating skull wounds, and grenade accidents to the hands were frequently seen. Asepsis was difficult of achievement, but not impossible.

Treatment had to be life-saving and conservative rather than directed towards anatomical perfection. All wounds were left open, except those of the skull and thorax. According to one's position in the field and the depth of penetration by raiding parties, the wounded received treatment at intervals varying from a few minutes to several days after being injured. Wounds seen early were thoroughly excised; foreign bodies were removed together with loose pieces of bone, and the wounds were left open. Wound depths were generously powdered with sulphanilamide after being moistened with saline solution and were covered with "Vaseline" gauze; the whole limb was then immobilized with plaster of Paris ("closed plaster technique").

Wounds seen later than twelve hours after infliction were dealt with much less radically; *débridement*, with good and deep drainage after the removal of foreign bodies, was followed by similar immobilization.

A good plaster cast was as essential as the thoroughness of the *débridement*, since there was no need to entice an Abyssinian to become ambulant.

No skeletal traction apparatus was carried; a Thomas splint with adhesive plaster extension was the only means of applying traction to fractured femora. Fractured humeri were found difficult to control; plaster slabs were applied and the arm was bound to the side.

In serious cases sulphapyridine was given by mouth, four tablets at once and four three times a day. At times it was more expedient to give an initial large dose followed by a single dose every day, especially if the patient had to be left.

Thoracic wounds were frequent, though most were not severe. The through-and-through type responded to rest, warmth, the administration of morphine, and immobility, aspiration rarely being necessary. Sucking wounds were easily sutured without anæsthesia. Only obvious foreign bodies were removed and deliberate thoracotomy was never performed. On two occasions alone was slow aspiration necessary to relieve respiratory embarrassment from a large hæmothorax. "M & B 693" tablets were given as a routine measure.

Abdominal wounds were few, and seen late, and large doses of morphine were the only measures adopted. Laparotomy could not be performed under the primitive conditions under which one worked. A multiplicity of wounds with a bad prognosis could command only morphine in many cases.

Head wounds were infrequent. Treatment consisted of shaving of the neighbouring scalp, excision of wound edges, enlargement of the wound, and removal of obvious foreign bodies and loose bone. Wound tracts were gently probed and the scalp was sutured. If the *dura mater* was intact, or if there was a retained deep foreign body, no interference was considered. In these wounds, as in others, powdered sulphanilamide was applied after they had been moistened, and a "Vaseline" dressing was applied. Two men with oozing brain matter recovered, with resulting permanent defects.

Amputations were performed in modified guillotine fashion; skin flaps were left unsutured for a few days.

Very few burns were seen. These were treated with baths and "Vaseline" dressings.

It is thought that if raiding parties are landed or asked to fight in hostile areas against entrenched or superior foes, then a medical service must not be denied them. In this, as in previous wars, the strategy of British Command and organization of the local native population are most important. Confidence is established and morale is improved if native chiefs know that the British "Sahib"

can do something for their wounded. A friendly native population can sway a campaign and pave the way for the arrival of regular troops. In Abyssinia the provision of prompt medical treatment to wounded guerrillas impressed and earned the gratitude of the native forces, whose friendship and help were so important to the furthering of British aims.

Acknowledgement.

The helpful criticism of Lieutenant-Colonel E. S. J. King in the compilation of this article is gratefully acknowledged. Captain C. R. B. Blackburn's dispatch of fresh medical equipment after an enemy raid on our headquarters early in the campaign, and Captain I. A. Brodziak's timely appearance with it, were greatly appreciated.

NOTES ON SKIN INFECTIONS: DARWIN.

By ALAN FROST,

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DURING the period from March to May, 1942, I was able to examine about 250 patients suffering from skin infections, and I treated sixty patients for approximately six weeks. As a working classification of the lesions, the following is suggested:

Traumatic lesions, caused by barbed wire, falls *et cetera*.
Infected bites *et cetera*.
Exogenous infections, acne *et cetera*.
Solar sensitivity.

Clinical Observations.

The following clinical features were noticed.

No matter what type of skin infection was present, remarkable improvement was seen in most cases after three or four days in hospital. The increase in the vitality of the patient, from one of minor lethargy to active participation in "ward games", was noticeable. This was constantly remarked on by the ward sisters.

A particular group of fifty patients, who had been in hospital for an average of nine days, were asked to assist in the movement of the ward from one site to another—a task entailing physical labour in hot, sweaty, dusty surroundings. The average time before discharge from hospital increased in this group from nine days to fourteen to twenty days.

Each patient was given two ounces of tomato juice alternating each day with pineapple juice and "Justfruit", orange or lemon. Two or three ascorbic acid tablets and salt tablets, "Marmite" (as much as necessary) and full hospital diet were also given. The few patients weighed showed a definite improvement in weight.

Various combinations of dyes were tried, but were found unsuccessful. They usually formed a crust on the ulcer area; but beneath this pus formation continued.

The commonest findings in smears on pathological examination were hemolytic staphylococci, hemolytic streptococci and occasional diphtheroids.

Strapping of indolent ulcers was a complete failure and retarded healing processes.

"M & B 693" ointment (5% "M & B 693" in glycerin) cleared the more infected wounds and ulcers and stimulated granulation in some cases to hypergranulation; but it did not assist healing—in fact, it appeared to retard it. The best results were obtained if it was left in contact with the ulcer for two or three days.

Soap and water with the addition of "Dettol" (5%) and thorough cleansing of legs twice a day gave the best average results.

Rises of temperature were uncommon, even in the presence of very dirty ulcers and wounds, except when lymphangitis or lymphadenitis of the upper limbs was present.

If lesions generally could be kept reasonably dry by exposure to the sun, powder and dry dressings, healing was more rapid.

Folliculitis of the axillae was often prevented or reduced by prophylactic painting of the area with *Tinctura Iodi Mitis* and powder.

Frequently, the changing of treatment from medications to dry dressings for a few days was beneficial.

The use of "Cellophane" sheets from cigarette boxes was tried, to reduce the frequent removal of dressings from chronic ulcers *et cetera*. Sweat and condensation, however, soon made them useless, although for a few days they allowed of exposure of the areas to the sun.

Contamination of infected areas by swabbing was reduced, I think, by the introduction of a "De Vilbiss" spray for the application of dyes *et cetera* to infected areas.

The separation of toes by cotton wool rolls was used in all cases of foot tinea and greatly assisted in quick reduction of symptoms.

Attempts to establish a fungal basis for indolent ulcers were not encouraging.

Towards the latter part of May, with the onset of cooler weather, an improvement was noticed amongst the patients suffering from skin lesions.

Ointments were not successful in this climate. Moisture, sweat *et cetera* tended to keep the lesions damp and lifted the ointments.

It was felt that too frequent use of soap in showering tended to lower the resistance of the skin to infection.

It was considered best to evacuate patients with early lesions which seemed to be about to become chronic, as little or no progress was made if they were kept in "hope".

Traumatic Lesions.

Traumatic lesions were common from barbed wire, trip wires *et cetera*. Such lesions are usually indolent. In the acute stages of infection hot corrosive sublimate compresses (1 in 1,000), followed by the application of "M & B 693" ointment, were successful in reducing the inflammation, assisted by elevation of the limb and rest.

Some lesions on shin areas were resistant, but some ultimately healed with dry dressings and rest.

Infected Bites.

Infected bites were common from sandflies, mosquitoes, spiders and scorpions. The first two insects were the commonest offenders; sandfly bites affected the lower limb and mosquitoes usually the upper limb, elbows *et cetera*. These bites nearly all became infected with staphylococci and streptococci. Ulcers, one-half inch by one inch by two inches in area, were formed in some cases, and were largely aggravated by scratching with subsequent secondary infection. Treatment by early stimulation by heat, later an antiseptic application and finally silver nitrate to form a coagulum seal, was found effective. The ulcers were indolent, however, and in spite of reaching a clean, dry stage with good granulation, quite often would not heal. Whitfield's ointment was in some cases effective at this stage.

In a fair percentage of cases rapid improvement took place for the first few days, and when it was thought that the patients were fit for discharge from hospital, the lesions would break down again.

Exogenous Infections.

Exogenous infections, such as acne *et cetera*, were common.

Impetigo was usually resistant to *Hydrargyrum Ammoniatum*. Scrubbing with soap and water and "Dettol" was usually more effective.

Bullous impetigo was not uncommon. Usually it responded to mercuric chloride compresses and later to application of zinc cream.

In tinea, good results were obtained by separation of the toes and by the use of "Mycozol" and iodine for lesions on the body; iodine was applied to the periphery

and "Mycozol" to the centre. One patient with large tinea areas on the body showed good results with iodine and silver nitrate applied when the iodine was still moist.

As a routine measure in cases of tinea, the issue shorts were boiled and hospital shorts were issued whilst the patient was in hospital.

A plug of cotton wool soaked in a 40% solution of formalin was placed in the toe of the boot, and then the boots were sealed with paper and left in the sun for twelve hours. As far as possible, these boots were not worn by a patient until he was leaving hospital.

For intertrigo, dye and a powder with a boracic base were used.

Solar Sensitivity.

Men suffering from lesions due to solar sensitivity did not show much improvement, as was to be expected, and were evacuated as soon as possible.

Other Lesions.

Finally, minor infections became major ulcers in a short time. Three patients showed sensitivity to plants; those tested (sent by Lieutenant-Colonel Ingram) for investigation in Sydney gave negative results.

Occasionally grass seeds were found embedded in ulcers; these may be the cause of some lower limb ulcerations.

From the histories taken on a set scheme, no single factor became constant as a cause of the so-called tropical ulcer.

Some clear skins became reinfected (impetigo) in a week on the men's return to camp life. Lack of washing facilities in scattered areas I believe to be an important factor. Vitamin deficiency may have some bearing on the condition.

Drugs and ointments were scarce, and to conserve supplies only simple hospital prescriptions (standard formulæ) were used.

My thanks are due to Lieutenant-Colonel J. B. McElhone and latterly to Colonel J. R. Donaldson, Commanding Officer, 119th General Hospital; to Lieutenant-Colonel W. W. Ingram, Officer Commanding the Medical Division; to Captain O. Alpina for his cooperation; to the ward sisters for their enthusiasm in trying ideas; and to Mr. McKenzie, Australian Red Cross District Commissioner, who made available all the extra food and fruit juices.

NEUROTIC CASUALTIES IN THE FIELD.

By HAROLD R. LOVE, M.B., B.S.,
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NEUROTIC illness in soldiers is a potential source both of serious wastage of manpower in the field and of prolonged and refractory post-war disability. Much has been written on the subject since the outbreak of the present war, and a great deal of light has been thrown upon its aetiology and prevention; but with the outstanding exception of Colonel W. James's tremendously valuable pamphlet "Psychiatric Casualties in the Middle East", little or nothing is available to the average regimental or field ambulance medical officer, and the tendency is for the subject to be regarded as the mysterious and inalienable preserve of the psychiatric specialist. This is the more to be deplored, since the most fruitful opportunities for the prevention and treatment of neurotic illnesses undoubtedly occur in their early and indefinite stages and lie in the hands of regimental medical personnel; in fact, in contrast to most other forms of battle casualty, the farther from his unit a man is evacuated with neurotic disability, the less in proportion are his prospects of returning as an efficient soldier.

In Tobruk, during the spring and summer of 1941, the problem of the disposal and treatment of this type of casualty assumed a peculiar urgency and clarity of outline.

There existed a state of siege, following a long, disappointing and in many instances exhausting retreat from western Cyrenaica, in which many of the units concerned were fighting their first engagements. The difficulties attending reinforcement and evacuation were enormous, enemy air activity was heavy and continuous, and nowhere within the perimeter could more than relative security, rest and quiet be provided. These circumstances together afforded both ideal conditions for the production of neurotic casualties and grave difficulties in their treatment, while at the same time a paramount necessity existed for keeping every possible man fit and available for duty. That in the circumstances the number of neurotic casualties remained so low and the general morale and cheerfulness of the troops so high, reflects real credit on the toughness of moral fibre of the individual soldier and on the qualities of leadership displayed.

In the middle of April, in order to relieve to some extent the strain on the resources of the Fourth Australian General Hospital, which was working under extremely difficult conditions in Tobruk township itself, the evacuation of nervous casualties was for a time mainly canalized through the Third Australian Field Ambulance, whose main dressing station was situated at the southern end of the Wadi Auda. Here, over a period of some five months, 174 men, representing 180 admissions, were "staged", rested, given minor treatment and drafted either back to units or on to the Fourth Australian General Hospital. These men seen in the ambulance lines were neither statistically representative of the whole body of nervous casualties occurring in Tobruk, nor unselected. Throughout the whole period regimental medical officers were instructed to retain every possible man in the unit lines, and by judicious resting, allotment of duties and general attention to mental hygiene, to deal with their own nervous cases in the early stages. Men with milder types of disorders were thus kept and treated within units, while others with disorders of all degrees of severity were evacuated direct to hospital. Nevertheless, the patients seen represent fairly exactly a general picture of the acute nervous casualty as he was encountered under these conditions, and more particularly as he presented himself to the medical staff of a field ambulance.

No figures can be given of the ultimate condition or fate of men sent back to units or to hospitals respectively, nor even of such factors as age distribution and past histories of nervous illness or head injury among the whole body of the units concerned. It will be realized, then, that the observations made here are of value only as impressions and as supplementary to more exact scientific investigations, and are set down subject to these limitations. It is greatly to be hoped that figures for these other factors, as well as for such imponderables as the incidence of outstanding courage among units as a whole and among the group of neurotic casualties, may in the course of time become available.

Classification and Disposal.

Of the men admitted to the main dressing station with nervous symptoms, twelve were also suffering from organic disease or injury and were classified separately. Seven of these had minor fever or trauma associated with physical exhaustion and insomnia, and all of these recovered speedily and completely, and returned to their units. Two men with dyspepsia, thought to be organic, and three patients suffering respectively from fibrositis, thyrotoxicosis and hypertension with subthyroidism were sent to hospital. In addition, three patients with either symptoms or a frank past history of schizophrenic breakdown, and one man, aged forty years, with delusions of reference and persecution, were also evacuated as actual or potential psychotic casualties.

Of the remainder, 18 were suffering from hysteria, and the balance, consisting of 140, were affected by fear or anxiety states. Nine of the 18 men with hysteria had, or developed, anxiety symptoms, transitory in three instances, but requiring the patients' evacuation in the other six. Of the hysterics without anxiety symptoms, four were evacuated and five returned to their units.

The disposal of the whole body of patients is shown in Table I.

TABLE I.

Classification.	Total Admitted.	Condition when Returned to Units.			Evacuated to Hospital.
		Good.	Fair.	Poor.	
Organic ..	12	7	—	—	5
Psychotic ..	4	—	—	—	4
Hysteria—					
With anxiety	9	3	—	—	6
Without anxiety	9	5	—	—	4
Fear and anxiety	140	30	32	19	62
Total neuroses ..	158	38	32	19	72
Percentage of all neuroses ..	100	24	20	12	44

Of all neurotic casualties, 44% were thus returned to units in apparently good or fair shape, an approximately equal percentage were evacuated to hospital, while a borderline 12% were sent back to their units, although their symptoms were mainly unrelieved. No information is available as to the final military efficiency of any group.

Neurotic casualties were heaviest, as might be expected, about the times of maximum enemy activity. The weeks ending May 4 and May 11 produced admissions of 49 (31%) and 43 (27%) respectively, corresponding with the period of determined enemy action which reached its peak on the night of May 4 and 5, while the week ending June 22 produced another peak of 22 cases (14%) for similar reasons. Otherwise, admissions were fairly evenly spaced, with a general tendency to decrease with time as the troops became seasoned and the psychologically unfit were weeded out.

Individual units of approximately equal standards of training and stress showed notable divergences in the number of neurotic casualties. While the average number of admissions to the main dressing station from infantry battalions was seven, the extremes varied from one only to 27. Field and anti-aircraft gunners showed a low incidence, and although the numbers dealt with are too small to allow rigid conclusions to be drawn, it seems probable that in both instances points of significant psychological moment are involved.

Casualties classified into age groups are shown in Table II. A certain number of the troops employed in the line consisted of units formed and trained for other than front line infantry work, in which the number of older men reached a higher percentage than obtained in the regular infantry battalions. Admissions from these units are separated in Table II under column B, while column A represents admissions from normal infantry battalions and field units.

It will be noted that 37 casualties (23.4%) were men aged over thirty-five years, 20 (12.7%) from group A and 17 (10.7%) from the much smaller group B. Although precise figures are not available, a rough estimate,

designed to err toward an outside figure, places the relative total strength of B units to A units at about 12.5% and the percentage of men in A units over the age of thirty-five years at about 5% of all other ranks. The impression is thus gained that a disproportionately large percentage of this series of neurotic casualties consisted of men aged over thirty-five years, and this would seem to hold even if the percentages estimated above prove eventually to be considerably lower than the actual figures.

The past histories of all casualties admitted to the station were gone into briefly and the findings are given in Table III. For various reasons it was not possible to note consistently in every case details of pre-enlistment personality, nervous history and social adjustments; but inquiry was made in each instance into three perhaps somewhat arbitrarily selected factors. First, inquiry was made into the occurrence of any past nervous breakdown, the criterion being the history of any neurotic or psychotic illness involving prolonged periods of medical treatment or loss of working time. Secondly, under the general heading of nervous disability were noted any outstanding psychopathic deviations, including abnormalities of personality or behaviour, phobias, homosexuality, and such conditions as mental backwardness, delinquency and fits. Finally, the occurrence in the past of any head injury involving concussion or fractured skull was noted. The results were as shown in Table III.

TABLE III.

Age Group. (Years.)	Nervous Breakdown.	Other Nervous Disability.	Head Injury.	Total.
Over 35	2	9	2	13
Under 35	18	25	4	47
Total	20	34	6	60
Percentage of all neuroses ..	12.7	21.5	3.8	38.0

From these figures it would appear that an unduly large proportion of these casualties have a definite and easily elicited past history which might have given a clue to their liability to breakdown under battle conditions. If, as a matter of further interest, we add the number of men, aged over thirty-five years, with clear past histories to the total of men of all ages with suspicious past histories, we find that no fewer than 84 men (or 53% of this series) might have been suspected on grounds of age, past history or both, of possible inability to stand up to the strain of battle conditions.

Once again, of course, to be valid these figures should be compared with similar figures for non-neurotics and for whole units; but on the whole the combined figure seems very high. Naturally, it does not hold that any man over the age of thirty-five years, or any man with a bad nervous past history, is incapable of becoming a highly efficient and courageous soldier; but it would seem that such men might be better drafted provisionally, in the beginning, to duties not exposing them to the rigours and nervous strain of the line.

TABLE II.

Age Group. (Years.)	Fear and Anxiety.			Hysteria.			All Neuroses.		
	A.	B.	Total.	A.	B.	Total.	A.	B.	Total.
Under 18	2	—	2	—	—	—	2	—	2
18 to 25	52	5	57	6	—	6	58	5	63
26 to 30	27	—	27	6	—	6	33	—	33
31 to 35	16	4	20	3	—	3	19	4	23
Over 35	19	15	34	1	2	3	20	17	37
Total	116	24	140	16	2	18	132	26	158

Clinical Types.

Hysteria.

Of 18 cases of hysteria, 11 were fugal in type. Five of these patients gave the characteristic story of a "near miss" from bomb or shell, which was followed by a period of unconsciousness or amnesia, during which the patient may have "lain like a log", twitched, walked about in dazed and aimless fashion, or "run round in circles, screaming". All five had amnesia of non-retrograde type; and all but one, who developed a severe anxiety state, were soon able to return to their units with very little complaint, except, in some instances, slight headache. Of the remaining six whose condition was classed as fugal, two were men who during bombing or shelling ran about and screamed or shouted, but whose amnesia was partial, temporary or otherwise doubtful; while two more were men who were described as "fainting" during air raids. It is possible that these cases should be classified as acute fear states or states of syncope respectively, but there seems no very good reason for separating them. The remaining two men of the group had developed automatisms. One of these dated his symptoms from an occasion when he was pinned beneath an overturned truck; the other had no such acute onset, but his condition had developed gradually soon after his arrival in the Middle East. Both men gave almost identical histories of "going to sleep on their feet" while going about their duties, waking later to find that they had no recollection of their actions for variable periods of time past. One of them, for instance, would be observed washing his face over and over again, without having any remembrance of the actions when questioned.

A typical case of hysterical fugue in war is exemplified by the following:

Private E.D., aged thirty-one years, came under concentrated shell fire on the night of May 2, one shell finally bursting four feet to one side of him. He remembered this, and remembered a severe pain in his head; but remembered no more until he "woke up", uninjured, in his regimental aid post. He was told that he had "gone mad and run around in circles" and had had to be forcibly restrained by his mates.

When examined on the following morning, he had slept well with the help of sedatives. His pulse rate was 90 per minute, and except for some fine tremor of his hands and an anxious expression, general examination revealed no abnormality. On May 4, however, he complained of drowsiness and headache and was extremely nervous and anxious. He slept badly in spite of sedatives, and on the following day he complained of great shortness of breath and exhaustion on slight effort. His tremor was found to have become gross and pronounced palmar and axillary sweating was present; tachycardia and dyspnoea appeared on slight exertion, and he was evacuated to hospital with the diagnosis of acute anxiety state of "effort syndrome" type.

He had suffered from a nervous breakdown eighteen months before enlisting in the army.

The other seven hysterical casualties consisted of two with hysterical gait and five with hystero-epilepsy, stupor, deaf-mutism, deafness, and impaired vision with triptopia respectively. The man suffering from seizures had continued them from civilian life, and the deaf man and one of those with hysterical gait had similarly developed their symptoms on a pre-enlistment foundation of mild otosclerotic deafness and coccydynia respectively. The man with ocular symptoms was a youth who had previously been wounded in the arm, and had been in hospital during a bombing attack. He became acutely anxious, and his eye disability developed on his rejoining his unit in the line. The remaining three cases resembled the fugal group, in that the symptoms followed immediately after a "near miss" from a high-explosive missile.

The two patients with hysterical gait were easily and quickly relieved of their symptoms and returned to their units without apparent anxiety or other neurotic signs. The remainder of the group, however, were for various reasons evacuated to hospital.

The recovery rate in this small group of hysterics ran on the whole parallel with that in the anxiety states. The dissociative mechanism by which the hysterical nervous system retreats from intolerable emotions or situations is

no better exemplified than in these acute battle types of hysteria, and the problem of assessing the future efficiency and reliability of a man who has once suffered a fugue or conversion hysteria, is no simple one. In general, the man who develops hysterical symptoms except under acute, intolerable stress and with no underlying chronic anxiety factor, should always be regarded with the gravest suspicion, even if he appears to recover quickly and completely when the strain is removed.

Fear and Anxiety States.

The greater part of the neurotic casualties, 140 in number, consisted of men suffering from fear and anxiety states. Whether any distinction of importance can be drawn between the two is a matter upon which there is some difference of opinion; but there would seem certainly to be two distinct types, distinguishable both upon theoretical physiological grounds and upon reaction to treatment. From the point of view of diagnosis, however, these acute cases all seem to fit into one homogeneous clinical entity and to differ only in method of onset, degree of severity and chronicity.

Of the symptoms in this group, present on admission to the main dressing station, fear or acute nervousness was universal, while insomnia, sense of exhaustion and depression were practically so. Then followed in order of frequency tremulousness, anorexia, headache, bodily aches and pains, dizziness, abdominal discomfort, nausea, vomiting, palpitation, precordial pain, dyspnoea, weeping, blurring of vision, excessive sweating, inability to concentrate, stammering and enuresis.

On examination of the patients the most constant findings were an anxious and drawn expression, tremor of hands, eyelids and tongue, axillary and palmar sweating, and tachycardia. The blood pressure was notable for its variability and lability. The tendon reflexes varied greatly from individual to individual, ranging from sluggish to grossly hyperactive. This hyperactivity of tendon reflexes seemed to bear no constant relationship to the degree of tremor present, nor did it appear to have any prognostic import.

In two cases the usual depression observed was exaggerated to the point of almost continuous weeping, and on the surface dominated the clinical picture. Other cases similarly tended to fall into groups depending upon whether the main or most severe symptoms were predominantly skeletal, gastro-intestinal, cardio-respiratory or emotional. Da Costa's syndrome was seen classically developed in only four cases, although many exhibited individual symptoms formerly assigned to this condition.

On the whole, complaints of physical symptoms were correctly related and subordinated by patients to their underlying psychic causes. Shame, dismay or depression over their inability to "carry on" were often expressed, as well as emphatic concern lest they should be regarded as cowards or malingerers. Some patients there were, as might be expected, who expressed determination not to return to the line at any cost; but against these were a far greater number of men asking to be sent back to their units while they were still obviously unfit to go. Certain it is that the men with severe fear states, the "wind-up" or "bomb-happy" people of current slang, did, between the ubiquity of their fears and the torments of conscience, suffer most unenviably. They scarcely dared to leave their shelters even for meals, their every sense was strained, obsessed and dominated by logically groundless dread, and it is small wonder that some, if not evacuated from the line, sought relief in a self-inflicted wound or even suicide. The truly amazing thing is the manner in which some men, in spite of their mental sufferings, were able by dint of sheer moral courage to carry on and do successful jobs.

The onset of these fear and anxiety conditions varied greatly. At one extreme was the type with gradual and progressive increase of symptoms from the moment of stepping aboard the transport at the port of embarkation, with a final precipitation of severe symptoms at the first hint of enemy action; while at the other were those men of undoubted courage, in whose case only

long and severe exposure to strain, exhaustion and insomnia had finally brought about a breakdown.

As instances of these various types the following case histories may be selected.

Sapper B., aged twenty-two years, admitted to the dressing station on April 22, 1941, stated that he had been carrying on normal duties until five days previously, when, while mending wire at night, his party had been heavily shelled and had been forced to remain out all night under fire. Since this he had been nervous and shaky with tightness in his chest and "stomach turning over". He slept very little and had nightmares of shelling.

He had been nervous all his life and easily frightened. He passed the Intermediate examination at the age of thirteen years, left school at the age of fifteen years, and had always been in constant work prior to enlistment.

On examination, he was a thin, intelligent-looking youth, with an anxious, drawn expression. There was a slight, fine tremor of the hands, eyelids and tongue. The blood pressure was 140 millimetres of mercury systolic and 75 diastolic. Examination otherwise revealed no abnormality.

He was given bromides, 15 grains three times a day, and "Luminal" at night. By April 24 he was cheerful and beginning to sleep well without sedation, and on April 28 was discharged to his unit, feeling well and confident.

Private C., aged thirty-five years, was admitted to the dressing station on April 20. He stated that ever since landing in Egypt he had become increasingly nervous, his "stomach was in a quiver", and he had suffered from lower abdominal pain, trembling, pounding in the ears and insomnia. These symptoms increased when he came to Tobruk, and whenever an air raid occurred he "went into a shaking spasm" and vomited. His appetite was poor. He slept very badly, and frequently awoke sweating and trembling. He could not concentrate and had lost all confidence in himself. He had previously suffered from appendicitis and plumbism, but no nervous illness. His home environment was good, and at school he was "average" at work and play.

On examination, he was found to have an anxious expression and hesitant speech. His pulse rate was 102 per minute. The tendon reflexes were sluggish and slight tremor was present. Otherwise no abnormality was detected. He was given sedation and slept well, and on April 22, two days after his admission, he was sent back to his unit at his own request, as he felt and looked confident and well, and was anxious to rehabilitate himself.

Private F., aged seventeen years, was admitted to the dressing station on April 22. A fortnight previously a plane had bombed and machine-gunned the truck he was driving, one bomb dropping about thirty feet away. He was uninjured, but became intensely frightened, so that he could not bear to leave his shelter, and if he did so spent the whole time in an agony of apprehension watching the sky for aeroplanes. He did not sleep and had complete anorexia.

His family and school history were above normal, and he had never suffered from any nervous illness.

Examination revealed an intensely frightened, immature youth. Tremor and sweating were excessive, and he started at the slightest sound. Tachycardia was pronounced. Otherwise no abnormality was detected. He was given bromides and "Luminal", and considerable time was spent in explanation and encouragement; but his condition steadily deteriorated. On April 24 he was extremely depressed, complained of continual headache, and could hardly be persuaded to move a yard from shelter. On May 3 he was still sleepless and had commenced to vomit after all meals, and on the following day he was evacuated to hospital. He was subsequently "boarded" and returned to Australia.

Private A.H., aged forty-four years, was admitted to the station on April 29. He had been normal until a fortnight previously when a bomb had fallen a hundred yards from the trench in which he was taking cover. He could not leave the trench for some hours after this incident, and subsequently found himself unable to leave his shelter even for meals. His sleep was broken and he started violently at the slightest noise.

During the last war he had suffered from "shell-shock", and was in hospital for nearly two years and in receipt of a pension for a further ten years on this account. Since then he had always been very nervous.

Examination revealed a highly nervous, thin man looking older than his years, sighing deeply, and with gross tremor. The reflexes were intensely hyperactive, but the other systems were normal. He was given sedation with bromides by day, and up to three grains of "Luminal" at night, but

failed to show any improvement, and on May 1 was evacuated to hospital.

Treatment of Neuroses Under Ambulance Conditions.

Treatment in the ambulance lines was limited to rest, sedation and the simplest forms of encouragement, persuasion and occupation. The main dressing station was sited in and about a rocky wadi, about three miles distant from the harbour at Tobruk and more than half a mile away from any other regularly attacked military target. The neurotic patients lived in dugouts or rock shelters built into the sides of the wadi, and were admitted to the actual hospital tent only if requiring observation or urgent treatment. During the day they were employed in building dugouts, or were marched down to the beach for swimming and sun-baking. They were examined every day, and as far as possible the rationale of their condition was explained. Bromides were given during the day in the more severe cases only, and "Luminal" or chloral was administered at night in doses sufficient to produce sleep. Both these sedatives were discontinued as soon as possible.

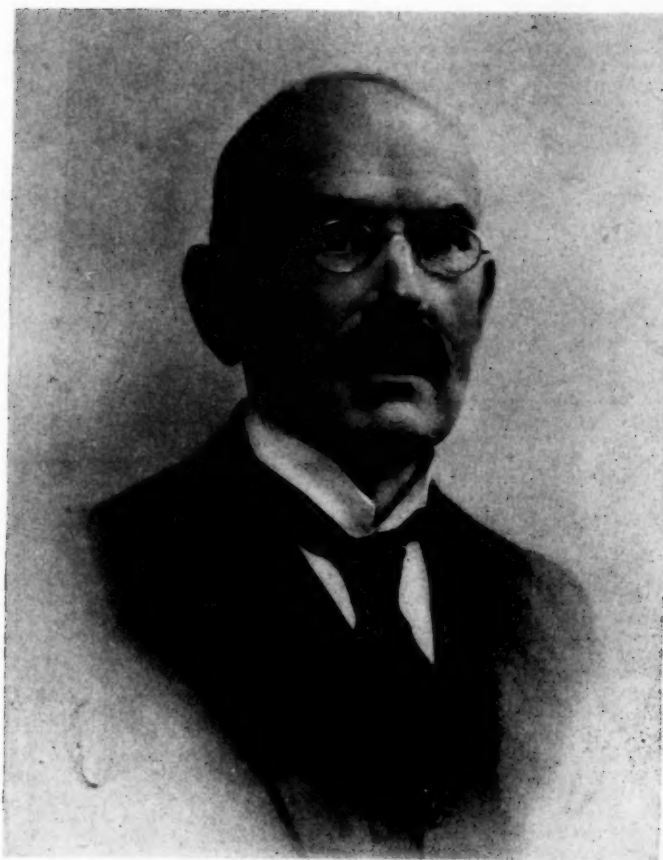
During enemy air alarms or activity, the ambulance orderlies were instructed to encourage the patients, by precept and example, to seek reasonable shelter quietly and without the panic rush that was likely to start at the first sight or sound of an aeroplane in the sky. This, however, was not always effective, and the spectacle of 20 or 30 frightened men rushing to cover, to the accompaniment of ironic cheers from the hardier and bolder, was for a short while an almost hourly occurrence. Recovering men, who otherwise might have been less precipitate, were often caught up in such panics by force of example, and the ability to resist was often one of the best indications of recovery. Return of normal cheerfulness and restoration of sleep without sedatives were, however, the two usual first signs of improvement, and when these occurred early, the man in question usually went on to speedy and complete rehabilitation.

It must always be questionable whether the association of neurotic patients in groups for treatment is a good thing from the point of view of treatment. Symptoms and defeatist points of view tend to be shared about, and the very infectiousness of panic may retard recovery in the highly suggestible. On the other hand, many of those with the condition in a milder form were undoubtedly shocked or amused into a normal state by the conduct of some of the men with grosser types of neuroses, and, of course, for the practical handling and organization of such casualties some form of centralization must be regarded as essential. Probably only a small percentage of "borderline" cases are likely to be affected by such association, provided that the general principles of hygiene and treatment are properly followed.

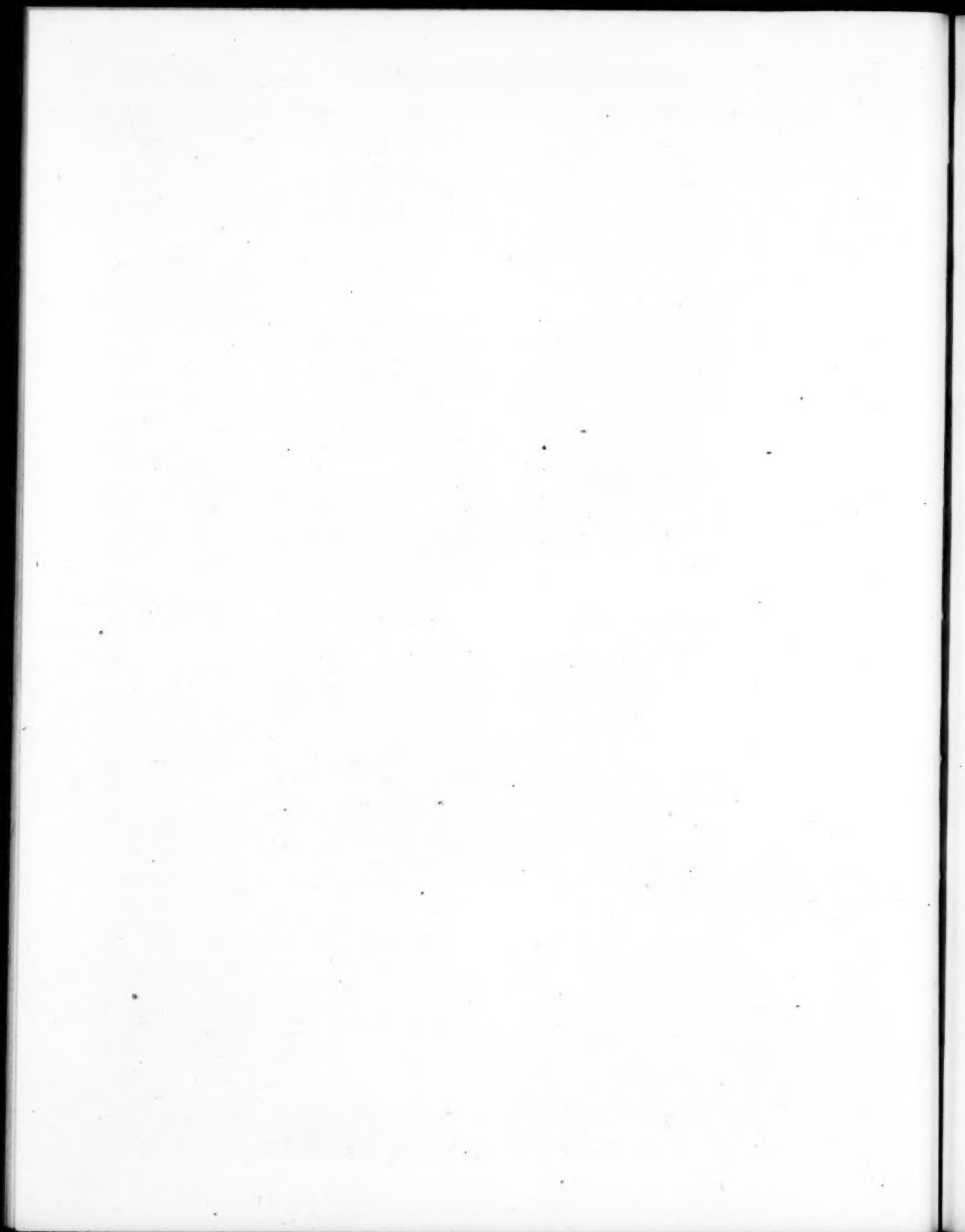
Mechanism of Anxiety States.

The mechanism of fear and anxiety states, in spite of great advances in our knowledge, remains incompletely understood. Cannon and his colleagues have demonstrated the function of the sympathetic-adrenal apparatus in the normal animal reaction to pain, cold, danger and other conditions calling for muscular exertion, and the majority of the symptoms of fear and anxiety can be related to the bodily changes occurring during this sympathetic-adrenal reaction—as, for instance, Paul Wood has recently shown for Da Costa's or effort syndrome. In addition, it must be remembered that when such a state of sympathetic excitement is long continued, especially when no muscular exertion occurs, secondary effects will be superadded from the prolonged adrenal activity and the glycogenolysis, insomnia, anorexia, hyperventilation and other phenomena which accompany it. To these again must be added certain other associated factors, such as the general sensory hyperacuity, the possible alterations in muscle metabolism concerned with the tremor and fatigability that occur, and also such apparently parasympathetic effects as bowel and bladder irritability, which sometimes accompany the fear reaction.

There is little difficulty, however, in comprehending the symptoms arising in these states as being the perception



Ralph Worrall -



in consciousness of gross, biologically purposive physical changes as Cannon has suggested. Nevertheless, the problems still remain, first, of determining what particular changes, bodily or mental, distinguish the anger reaction with its sense of muscular power, physical endurance and self-confidence, from the fear state with its fatigability, muscular exhaustion and depression; and secondly, of deciding what factors are involved in the dysfunction, the chronicity and divorce from biological reality which characterize the fully developed anxiety state.

To the first of these problems can be brought little more than mere conjecture. It has been suggested by MacDougall and others that the self-preservative instinct, when it lacks an outlet in effective action, may be experienced as the emotion of fear, and conversely, when effective action is possible, as anger. This, from a physiological point of view, begs the question; but there is undoubtedly a large element of truth in the distinction. It is of interest to note in this connexion the parallel between fear and anger states on the one hand and simple depressed and exalted states on the other. In both fear and depression the lack of energy, exhaustibility and general limpness of face, limb and respiratory musculature contrast strongly with the sthenic pressure of muscular activity in anger or exaltation, while the almost constant association of depression with anxiety states in varying degrees, and the return of energy and cheerfulness during recovery add point to the comparison.

Whatever may be the explanation, it is certain that good equipment, confidence and opportunities for effective aggressive action will determine a fighting as opposed to a fear reaction in troops, and *vice versa*. Heavy, unopposed attack from the air is, for instance, a fruitful source of neuroses in troops, particularly in units either not well equipped or not accustomed to defend themselves against it, while on the other hand, in well-equipped anti-aircraft units and in fighter squadrons, the fighting reaction is the rule.

In the case of the second problem posed, there is rather more upon which to build. We can accept for practical purposes the normal fear reaction as a variation of sympathetic-adrenal activity, and it seems logical to follow James and Lange in attributing the emotion of fear to a perception in consciousness of the intense and complex somatic changes involved. The matter then resolves itself into seeing fear and anxiety states in the light of Pavlov's elaboration of Herbert Spencer's original conception, as a complicated neuro-chemical reflex, which can be conditioned by environmental factors to reaction or inhibition, with those various summations, extinctions and facilitations by which such reaction and inhibition may be modified.

Some further complications remain. C. P. Symonds has suggested that in chronic anxiety conditions, actual changes in the emotional sensorium, comparable with those occurring neurologically in causalgia and phantom limb, may take place. He instances that "disagreeable sensations referred to viscera . . . are common without any corresponding disturbance of visceral function, sense of palpitation for instance, without alteration of cardiac rhythm", and links the affective neuroses with the affective psychoses as manifestations of one affective disorder, differing in clinical appearance only as the former are mergergastic and the latter holergastic.

While this may be so, there would seem to be, in the acute cases at all events, no lack of physical disturbance to account for the great majority of symptoms. There would also appear, moreover, to be sufficient in the known physiology of fear states and of conditioned reflexes to account for the chronicity of anxiety states in the greater number of instances without the postulation of central sensory changes.

The normal fear reaction is a complex reflex with its efferent arc proceeding through the sympathetic-adrenal innervation from the autonomic centres of the hypothalamus; these in turn are controlled from the cerebral hemispheres, whose function, in the words of Pavlov, is "that of reacting to signals presented by innumerable stimuli of interchangeable signification". Over the years from infancy onward this reflex is conditioned and

deconditioned to excitation and inhibition in dynamic equilibrium with the changing conditions of the environment of the individual, and we can conceive of fear and anxiety states as over-reactions, either in degree or in chronicity, of this reflex. Such over-reaction may remain biologically purposive, in which case it might be termed exaggerated fear reaction or hyperphobosis as W. A. Brend has suggested, or it may become divorced from biological reality and produce those states of chronic and apparently causeless fear which form the syndrome of anxiety neurosis.

Abnormal fear or anxiety may then be produced in at least four ways. First, at the lower extreme of the natural scale of variation, occur the men with congenitally timid personalities, in whom the fear reflex is easily and powerfully aroused. Men such as these should not be expected to become good soldiers; their temperamental reaction to even the mildest danger is excessive, and even if they do not develop neuroses in civil life, in warfare they cannot function efficiently, and tend to drift into the second and third classes to be described.

The second class of cases consists of those in which the fear reflex, by repetition and summation of the stimulus of danger, with constant reinforcement and lack of time for extinction, becomes either highly facilitated or conditioned to wider and wider associations, until practically the whole environment becomes an appropriate stimulus to fear. The aeroplane miles away in the sky, the sound of an internal combustion engine, loud noises, the flicker of a shadow on the ground, and indirectly, the pounding of their own hearts and the other symptoms of their abnormal physical state, all become signals for intense and uncontrollable dread. W. A. Brend has described this condition as it occurs in civilians subjected to frequent air raids, instancing cases of men and women who, normal and courageous in other respects, become paralysed with fear at the mere sound of the air raid siren. In military practice interesting results have been published by F. L. McLaughlin and W. M. Millar, who have reported the successful treatment of certain types of war neuroses by "de-conditioning" patients to the sounds of warfare and air raids by the use of gramophone records of these sounds, which are played over to patients while at the same time suggestion and persuasion are used.

The third type of anxiety state is analogous to what Pavlov has described as "analyser breakdown" in dogs. He showed that in dogs under conditions in which a noxious stimulus-reaction had to be inhibited over a time lag, or secondly, in which a discrimination approaching the limit of the animal's sensory powers had to be exercised to determine reaction or inhibition, a stage of delay in the first instance, or of similarity of stimulus in the second, could be reached, in the face of which the whole analyser mechanism of the animal's cortex appeared to break down. All the carefully built-up conditionings and all powers of inhibition were lost, and the animal subsided into a chronic irritable condition in many ways comparable to neurosis in human beings. Further attempts to condition these animals were fruitless, and only after long rest and treatment with bromides did an occasional one recover.

Even though an exact parallel can hardly be drawn between these experiments and the occurrence of neurosis in warfare, there are many obvious and fascinating points of resemblance. The soldier newly in action will normally react with varying degrees of fearfulness to the new dangers to which he finds himself exposed; but in general his fear reaction will tend to become internally inhibited and extinguished to all but essentials, as he learns to assess the real danger correctly, to ignore the sound and the fury, and to take appropriate steps in the presence of the former, provided, of course, that circumstances do not conspire to condition him in the manner described as occurring in the second type of case.

Should, however, his sensory or mental equipment or his training be below average, or should he encounter a set of circumstances before which they prove inadequate, more especially circumstances in which he is unable to relieve his mental and physical tension in action, his con-

dition will roughly parallel that of Pavlov's dogs, and prolongation or repetition of such undue calls on his powers of discrimination and inhibition may precipitate a breakdown of his capacity to inhibit his fear reflex, which may be complete and long-lasting. If the powers of adaptability to danger, in short, are overtaxed, they may be lost, and the fear reaction may be left disorganized and uncontrolled. Some types, at least, of intractable neuroses would seem almost certainly to fall into this category.

The fourth group of cases to be considered comprises those in which there is some mechanical, infective or metabolic upset of the fronto-hypothalamic mechanism. It is well known that even mild head injury, particularly when followed by inadequate rest, may give rise to a chronic anxiety state. Together with this type we may also consider chronic infections, such as tuberculosis; metabolic upsets, such as avitaminosis and menopausal and other glandular imbalances; uræmic, alcoholic, and other intoxications; and other similarly organic disorders with which anxiety states seem at times to be associated. Whether these types follow one of the other mechanisms, or whether we may logically postulate actual traumatic or chemical interference with hypothalamic or prefrontal function, there is no doubt as to the association, sometimes in severe form, of anxiety states with these organic conditions. The constant association, both ætiological and symptomatic, of sleep disturbance with fear and anxiety states again need hardly be further emphasized. From another point of view may be noted here the reported results of the relief of anxiety symptoms by surgical section of the fronto-hypothalamic fibres.

To sum up, the genesis of fear states and anxiety neuroses in dysfunction or perversion of the sympathetic-adrenal fear reflex would seem to rest upon a firm basis of both theoretical probability and confirming fact. Congenital hypersensitivity of the mechanism, organic interference, and finally various conditionings, either biologically logical or associated with over-taxing and breakdown of the cortical analyser, all seem to play a part and must be considered in any measures designed to prevent or treat the disability which may result. The hysteric reaction with its characteristic suggestibility and mechanism of dissociation may be considered as a different reaction occurring parallel to, and often associated with, such fear and anxiety states.

Incomplete as is our knowledge, there is still much upon which we can rely until such time as, in the light of fuller understanding of psycho-somatic disease, prevention and treatment, both in warfare and in civil life, may become simple, adequate and effective.

Prevention and Treatment in the Field.

All our knowledge of neurotic casualties indicates the importance and effectiveness of measures designed to prevent their occurrence, rather than to attempt to deal with them after they have developed. Obviously, such measures must start at the first medical examination of recruits, at which men of older age groups, or those who have past histories of nervous disabilities or head injuries, as well as men of low mentality or psychopathic personality, or those who show such signs of autonomic instability as persistent tachycardia, tremor, labile hypertension, or other signs, should be viewed with suspicion by members of medical boards, and either deferred for psychiatric opinion or classified at once as fit only for non-combatant service. Unfortunately this method cannot be wholly efficient. In the first place, as Surgeon-Commander Kempson Maddox has written, "no reliance can be placed on the statement of a keen young man with respect to his previous health" when confronting a medical board on enlistment; and secondly, it is not humanly possible by clinical examination to detect actual or potential neurotics in every instance.

The next step must be, as Colonel Graham Butler has advocated, the employment of the normal period of preliminary training for observation and sifting of recruits, and the relegation of the inept, the maladjusted, and the otherwise unsuitable to duties graduated to their mental and emotional capabilities. This weeding out, as well as

the more active treatment of neurosis in its early stages, must fall to the lot of the regimental medical officer, and its importance cannot be sufficiently stressed.

The next important factor consists in efficient training, equipment and leadership, together with the instillation of positive cheerfulness, *esprit de corps*, fighting spirit—all those indefinable factors, in short, comprehended in the term morale; and here it must be always remembered that such small things as provision of recreational amenities, regular mail, the encouragement of cheerfulness and the depreciation of depressing conversation, may all play a disproportionate and summative part. Constant cooperation between combatant and medical officers, and an understanding and realization by the latter of the nature of the factors involved, are of great importance.

In the field it is essential that the medical officer should recognize and treat nervous conditions at the earliest possible moment. Here again the confidence and cooperation of the commanding and other combatant officers and a knowledge of the men are indispensable. Men who become nervous, restless, moody, irritable, careless, and above all sleepless, must be marked down early, and by such measures as attention to sleep, resting, change of duties, and possibly by some method of "de-conditioning" them to the particular source of their fears, be brought round to a more efficient and comfortable frame of mind. "De-conditioning" can be done in as many ways as situations arise. Men, for instance, who through a previous bad experience have developed a dread of one certain part of the line or of one particular form of enemy attack, can often become inured if they are placed in the company of others for whom such special place or projectile holds no particular terrors. Again the "shelter habit" can by precept and example be discouraged. The simple physiology of "de-conditioning" consists in the fact that if the fear reflex is conditioned to a certain stimulus, harmless in itself, but having terrifying associations, repeated application of that stimulus, more particularly when reassociated with an atmosphere of cheerful pugnacity, will finally render that particular stimulus ineffective. It must always be remembered, however, that fear and insomnia form a vicious circle, and that this circle can and must be broken at the earliest possible stage by the ensurance of sleep.

The aim of every regimental medical officer should be a "nil" return of nervous casualties. There will always be in any unit a few men who can be employed only in sheltered duties, and there may occur men who actually break down and have, as a last resort, to be evacuated from the line. In both these situations it is essential to act early, tactfully and fairly, and without prejudicing the morale of the main body of sound men. Fear states are—in the phrase of Colonel James—an infectious disease, and the treatment and disposal of the subjects may, on occasion, call for superlative judgement and tact. Cases of frank insanity, on the other hand, usually present no difficulties either in diagnosis or in disposal.

In the treatment of men with fully developed neuroses, whether dramatically hysterical or abjectly fearful, the first and most important thing is sleep. Food, hot drinks, and a sedative such as "Luminal" or chloral in doses sufficient to produce twelve to twenty-four hours' sleep, are often specific. After an action or spell in the line, it will often be found that quite a number of men develop insomnia, which, if not checked early, may undermine their resistance, and the greatest care should be taken to see that such men report and receive adequate treatment. A few good nights' sleep in these circumstances may well prevent a neurotic casualty or a self-inflicted wound.

With experience, a medical officer will soon learn to deal promptly and calmly with neurotic casualties, "to strengthen such as do stand; and to comfort and help the weak-hearted; and to raise up them that fall"; but his first experience during the strain of an action or of a stuporose hysteric near whom a shell has burst, or of a group of badly "rattled" men descending upon him *en masse* with every imaginable symptom, are bound to try to the full his diagnostic acumen and his presence of mind. The temptation to evacuate such men is often over-

powering; but one thing which experience has clearly shown is that, with proper handling, the number of men who require to be sent out of the unit lines may be reduced to a negligible figure. It requires confidence in diagnosis, prompt action as to treatment, and a certain hardness of heart to deal successfully with these casualties; but the medical officer will find that the results justify all the thought, care and determination he can bring to the matter.

Acknowledgements.

I should like to express my thanks to Lieutenant-Colonel M. L. D. McKeon and Lieutenant-Colonel N. H. Saxby, who successively commanded the 2/3 Australian Field Ambulance in Tobruk during the period, for their help and encouragement in this work done under their command; and to Lieutenant-Colonel I. J. Wood for invaluable criticism and advice.

No report of this nature could, moreover, be complete without acknowledgement of a tremendous debt to the Consultant in Psychiatry to the British Forces in the Middle East, Colonel W. James, Royal Army Medical Corps, for whose writings on the subject, and interest and advice during his visit to Tobruk, the most sincere thanks are due.

Finally, to the men who, under infinitely more difficult conditions, also handled these casualties—the regimental medical officers in the line and the staff of the Fourth Australian General Hospital at the harbour-side in Tobruk—I must also pay a tribute of esteem, both personal and professional. Particularly of the last-mentioned will the name and magnificent work of the late Lieutenant-Colonel Eric Cooper always be remembered by his colleagues with affection and with pride.

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A COMPARISON OF AGGLUTININ CONTENT OF RABBIT'S SERUM AFTER INJECTION OF LIQUID AND DRIED SERUM OF RABBITS IMMUNIZED WITH HUMAN GROUP A CELLS.

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 and the Red Cross Blood Transfusion Service
 (Victorian Division).

OBSERVATIONS to be published shortly indicate that the drying of human serum or other body fluids by Hardyization⁽¹⁾ does not materially alter either its agglutinins or corresponding receptor substances. It was considered, however, that this process might result in some chemical changes or diminution in molecule size, which would render such serum, when reconstituted, more apt than undried serum to diffuse out of the blood vessels if given intravenously.

¹ This work was done with the aid of a grant from the National Health and Medical Research Council.

It was thought that a possible method of obtaining data on this point would be to ascertain the length of time during which agglutinins directly attributable to the injection of dried and wet serum from the same source were retained in the recipient's blood.

To carry out these experiments with human beings would involve the use of a recipient of blood group O or of the same group as the serum injected. The recipient's serum titre would have to be very low (less than 1 in 10) and that of the injected serum very high in order to overcome the dilution (greater than 1 in 1,000). According to Aubert *et alii*⁽²⁾ it should also contain no receptor substances, which themselves might act as antigens. Such a combination of suitable recipient and donor is not easily arranged. Preliminary experiments were therefore carried out with rabbits.

Method.

Three rabbits were injected, which were shown to have no natural agglutinins for the human cells (group A, subgroup A1) with which it was proposed to immunize them, or a very low titre of such agglutinins, their respective titres being 1 in 8, 1 in 16 and 1 in 32. Ten cubic centimetres of the human blood were added to one cubic centimetre of glucose and citrate solution (1% glucose and 4% sodium citrate in distilled water).

Four injections of 0.25 cubic centimetre of washed and packed red cells were given intravenously on consecutive days. After an interval of ten days, one subcutaneous and five intravenous doses, each of 0.25 cubic centimetre, were given on consecutive days. After another ten days a similar series of injections was given. Two days after the last injection the rabbits were exsanguinated. The serum from the rabbits' blood obtained at this time was titrated for agglutinin and haemolysin content, the same A1 cells being used. Readings were made after two hours at room temperature. The results are shown in Table I.

TABLE I.

Number of Rabbit.	Original Titre.	Titre After Injection of Serum.	
		Agglutinin.	Haemolysin.
I	1 in 8	1 in 512,000	1 in 64
II	1 in 32	1 in 16,000	1 in 32
III	1 in 16	1 in 32,000	1 in 64

The serum from the three rabbits was pooled. One-half of it was dried by Hardyization and the other was used in the liquid state. The agglutinin titre of the pooled liquid serum was 1 in 32,000 and that of the dried serum after reconstitution to its original volume was 1 in 16,000.

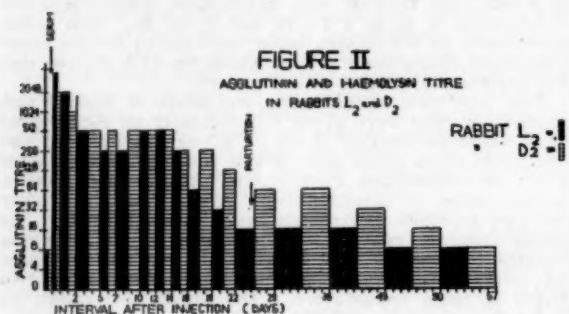
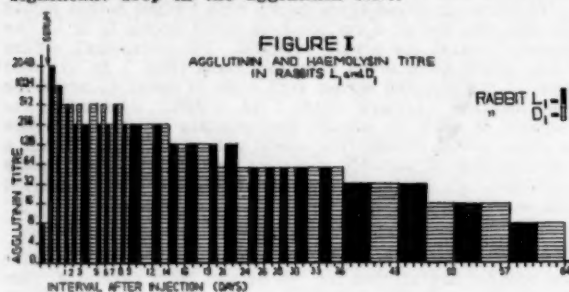
Two rabbits were then each given 15 cubic centimetres of liquid serum, and two were each given 15 cubic centimetres of reconstituted dried serum. The rabbits weighed approximately two kilograms each. The injections were given intravenously into ear veins over a period of two to four minutes.

Samples of blood were taken from the opposite ear of one of the rabbits given liquid serum (L1) and one of those given reconstituted serum (D1) at intervals of 10, 20, 30, 60, 120, 180 and 240 minutes after injection, twice on the following day, then once a day for twelve days, and subsequently at longer intervals, until agglutinin titre fell to its original level. As these investigations showed that no sudden fall occurred, the other two rabbits (L2 and D2) were examined less frequently. One uninoculated rabbit with a fairly high original anti-A titre (1 in 32) was bled at the same time as the second pair of inoculated rabbits, in order to estimate the effect of the taking of repeated small amounts of blood on the agglutinin and haemolysin titre. No demonstrable effect on the agglutinins was noted; haemolytic action was absent throughout.

Results.

These investigations, the results of which are shown graphically in Figures I and II, indicate that there was a slow, regular fall in agglutinin titre to the original level, which in rabbits L1 and D1 occurred at about the

ninth week, and in rabbit D2 at the end of the seventh week. Rabbit L2 presumably became pregnant about the sixth day before the commencement of the experiment. During the last week before parturition there was a significant drop in the agglutinin titre.



Discussion.

The level of the agglutinin titre immediately after injection, with slow, regular, progressive fall, is suggestive of retention for a time and subsequent gradual elimination of the introduced serum, or at least its globulin fraction, from the recipient's blood vessels.

It should be pointed out that the rabbits used were in normal health. The problem as to whether similar results would be obtained in anemic animals remains to be investigated.

Conclusions.

As judged by the agglutinin titre, liquid serum and dried serum (by Hardyization) behave similarly as regards retention in the blood vessels of the recipient.

Acknowledgements.

We wish to thank Miss F. E. Williams for assistance in this work.

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Reports of Cases.

EMBOLIA CUTIS BISMUTHICA: AN UNTOWARD ACCIDENT FOLLOWING THE INTRAMUSCULAR ADMINISTRATION OF BISMUTH SALICYLATE IN OIL.

By F. GOLDSCHLAG,
Sydney.

EVERY medical practitioner is familiar with some undesirable accidents due to the intramuscular deposit of preparations, especially of insoluble salts of heavy metals

like mercury, gold and bismuth. The most common of these reactions is a hard, painful infiltration of the muscle developing in fibrous tissue and impeding further injections in the same place. The infiltration may undergo resorption (which is the rule) or suppuration, with the formation of a sterile abscess. Sometimes deep-seated cysts are noted.

Injections of an insoluble salt into a vein result in a well-known and unpleasant complex of symptoms, with violent coughing immediately afterward, often accompanied by blood-stained sputum, rise of temperature and collapse. As a rule this condition is more alarming than really serious and clears up rapidly.

Arterial embolism caused by an injection must be regarded as a quite unusual accident. The common sources of this condition are endocarditis, thrombi of the left side of the heart, arterial plaques of the aorta or larger vessels and paradoxical emboli from the venous side. Other forms of emboli are fat globules, air bubbles, tumour cells and clumps of bacteria. *Embolia medicamentosa*, which is the subject of this report, is not mentioned, even in the modern textbooks of pathology by Muir, Boyd and Aschoff. It is this infrequent incidence of intraarterial embolism that has prompted me to present the following case.

Clinical Record.

Mrs. P.P., aged twenty-eight years, was under my treatment for a primary sore of the left *labium pudendi majus*. Dark-field examination revealed a great number of *Treponema pallida* organisms. Neither the Wassermann test nor Kahn's test produced a reaction.

Treatment with bismuth and arsphenamine was instituted. On May 27 the patient received the ninth intramuscular injection of a 10% solution of bismuth salicylate in oil in the left gluteus muscle. My technique is to give the injection into the upper outer quadrant, to detach the syringe from the needle after insertion and to watch the butt. Then after an interval of ten seconds it is my practice to attach the syringe, to aspirate twice and to remove the syringe again before injecting. The injection passed uneventfully.

About three hours later the patient felt an excruciating pain in the left buttock radiating into the left leg. She could hardly move and was confined to bed for forty-eight hours. On May 29 she was able to get up and come to my rooms. Her gait was greatly impaired, and the patient walked with difficulty trying to immobilize the left hip joint and knee joint. She said that the condition had somewhat improved and that the pain was more tolerable. An area about five by seven centimetres on the left buttock was infiltrated, swollen, hot and highly tender, even to light touch. The affected zone was not sharply defined, but subsided into more diffuse and superficial oedema of the surrounding tissue. The most striking feature was a strange picture formed by blue, slightly elevated, horizontal and parallel bands, about 0.5 centimetre wide, distributed on the buttock. A number of vertical smaller and less distinct streaks intersected the main trunks and formed a marmoraceous network, with slight bluish interstices and pronounced, infiltrated, deeply coloured meshwork. The condition resembled very much *erythema ab igne*, *Uredo racemosa*, and to some degree the common, more accentuated *cutis marmoracea*.

The diagnosis was obvious: embolic bismuth exanthem (Freudenthal) or the livedoid dermatitis of French authors.

Cold, wet dressings of lead subacetate and rest were recommended, and the acute symptoms subsided within two days. The region remained tender to pressure for a fortnight, and bluish discoloration with more livid main trunks was discernible for a period of five weeks. At the time of writing of this paper, about six weeks after the unfortunate injection, a marmoraceous network still persists. No further sequelae were noted, and subsequent injections into the affected buttock were well tolerated.

Comment.

Perusal of the literature reveals that European and American physicians have reported a small number of similar accidents. To Freudenthal⁽¹⁾ belongs the credit of having recognized the pathogenesis of the process and of having correctly interpreted the histological picture. He found the cutaneous arteries blocked with needle-like crystals of bismuth salicylate. The bismuth suspension was deposited into a deeper branch of an artery and then carried by the blood stream to the smaller cutaneous vessels, where it formed emboli. Clinical symptoms are due to perivascular inflammation and the pain to ischaemia.

Nicolau and other French authors⁽¹⁾⁽²⁾ performed very ingenious animal experiments and substantiated Freudenthal's findings. They called the condition livedoid dermatitis.

Fortunately accidents of this kind are exceedingly rare. Many thousands of injections have been administered without such a mishap. J. A. Gammel⁽³⁾ has reported five cases distributed over a series of about 45,000 intramuscular injections. In the last twenty-four years of my hospital and private practice I can record about 160,000 injections without the occurrence of an arterial embolism. During this time I saw only one case of this condition in Dr. Ostrowski's department at the General State Hospital, Lwow, Poland.

Inquiries among some highly competent dermatologists and surgeons of this country proved that *embolia medicamentosa* has not come within their personal experience. The perusal of Australian literature in this direction disclosed no reports of such cases. The realization of the possibility of such an accident is, nevertheless, important, as serious sequelae, even necrosis of a large part of the buttock (Gammel⁽³⁾), may result.

How can the mechanism of the embolism in question be explained? Nicolau's experiments and my own observation seem to show that the most careful technique may fail. Certainly it is not the compound, the technique or the speed of injection that is responsible. The fact that on aspiration blood is not obtained is not an absolute safeguard. If it is assumed that the affected artery is of a fairly large lumen, a minute amount of the salt may be deposited in the wall of the vessel and may afterward rupture into the lumen, with subsequent embolism in the cutaneous arteries.

To diminish any risk the use of needles with wider gauge is advisable. After the usual aspiration the needle should be detached for some time. The injections should be performed on a relaxed limb, and any pushing or pulling of the limb while the injection is actually being made should be carefully avoided.

Acknowledgements.

I wish to acknowledge my indebtedness to Dr. E. H. Molesworth for his help and criticism in the preparation of this paper.

Summary.

1. A case of embolic bismuth exanthem is reported.
2. The infrequency of such an accident is stressed.
3. The mechanism of *embolia medicamentosa* is discussed, and an attempt at explanation is made by the assumption that a small amount of compound may be deposited in the wall of an artery and then rupture into the lumen.
4. Some precautions are recommended.

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A CASE OF PICK'S CEREBRAL ATROPHY.

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PICK'S DISEASE, a comparatively rare form of presenile dementia associated with localized cerebral atrophy, was first described by Arnold Pick fifty years ago. The term "idio-

pathic circumscribed presenile cerebral atrophy" proposed by Nichols and Weigner⁽¹⁾ is to be preferred, in order to avoid confusion with Pick's syndrome (polyserositis) and with Niemann-Pick's disease. Recent reviews of the literature have been made by Ferraro and Jervis,⁽²⁾ by Löwenberg,⁽³⁾ by Löwenberg, Boyd and Salom,⁽⁴⁾ by Kinnier Wilson,⁽⁵⁾ by Malamud and Boyd,⁽⁶⁾ by McMenemey⁽⁷⁾ and by Hassin and Levitin.⁽⁸⁾

According to Ferraro and Jervis more than 70 pathologically verified cases had been reported up till 1936; most of these occurred on the Continent. A number of cases, however, have been recorded in the United States of America and a few in England. It is not improbable that cases of the disease occur in Australia; but so far as we have been able to determine none has been reported. For that reason, and in order to encourage the recording of other cases, it seemed of interest to publish the present report.

CLINICAL RECORD.

A.S.H., aged fifty, a white male patient born in South Australia, was admitted to the Enfield Receiving House on May 3, 1940; he was a married man with four healthy children. At school he was considered brilliant; later he attended the university and became a chartered accountant. He attained a high position in the Civil Service, and throughout life he was active intellectually until his illness began about two years prior to his admission to hospital. The medical certificate on his admission contained the following statements: "... very restless. Has a craze for killing ants, is childish, takes absolutely no interest in anything. In the past has been a great reader and student." Notes of the history obtained from his wife were as follows: "... has to be bathed now—in the past was very particular about his person. Voracious appetite. Will pick up food or rubbish from the gutter and eat it. Has a craving for sweets. Cannot concentrate. Is abnormal, good natured and childish."

While at Enfield Receiving House he was quiet in mood, but appeared confused. He wandered aimlessly about, attempting to go through every door. He was unoccupied and uninterested in anything. His memory was poor, especially for recent events, and he was disorientated in time and place. A provisional diagnosis of presenile dementia was made. A course of "Cardiazol" therapy (10 injections), given at the earnest request of his wife, resulted in no improvement, and on August 9 he was transferred to Parkside Mental Hospital with a diagnosis of organic dementia.

On his admission to the hospital he weighed 177 pounds. There was no demonstrable physical abnormality and the Wassermann test produced no reaction. Mentally he showed a well-defined organic syndrome. On comparison with his previous history a pronounced intellectual defect was present. He could initiate no conversation, but when pressed would reply fairly accurately to questions regarding his past life, birth place, school, family, position and present address. His memory, however, was faulty for recent events. For instance, he maintained that he had walked to Parkside from his home that morning, whereas, in fact, he had been at Enfield Receiving House for three months. He was disorientated in time and place. He carried out the 100-7 test accurately and was generally good at mental arithmetic. His proficiency in this direction was obviously connected with his occupation. He obeyed simple commands. Perception was poor and his attention was difficult to hold. Noticeable blunting of affect was present; his voice was low-pitched and monotonous, and his general expression was dull and ox-like. He remained unmoved by his own situation or by any reference to that of his family. Throughout the examination a generalized clouding of his mental processes seemed to be present. Although he answered many questions and did mental arithmetic, the answers were made sluggishly in response to the specific stimulus of the question, and no related associations were awakened. There was complete lack of spontaneity. Though he could reply to questions, he could give no account of himself or of his surroundings. After dressing each morning he was subject to persistent motor restlessness. He wandered aimlessly about the ward or yard, picking up rubbish, paper, string, wood, stones *et cetera* and chewing them. This activity seemed to be automatic or compulsive. It was impossible to hold any conversation with him, as he repeatedly walked inattentively away. If held and pressed for an answer, he would answer "yes" or "no", but showed signs of acute distress at being detained.

During the year for which he was at Parkside Mental Hospital his mental condition gradually became worse. In contrast, his physical state throughout remained satisfactory, except for an attack of dysentery in December, 1940. Intellectual deterioration proceeded further. Speech con-

¹ The pathological examination was carried out by Charles Swan, working with the aid of a grant from the National Health and Medical Research Council.

tracted to a monosyllabic "yes" or "no" on rare occasions. Faeces and urine were passed into his clothes, his nose ran and saliva drooled continuously from the corners of his mouth. The motor restlessness persisted; he became vaguely apprehensive and hostile at any attempt to prevent it. The few remnants of mind exhibited on his admission to the hospital were gradually lost and he became purely vegetative. He collapsed while eating his evening meal and died on July 30, 1941, at the age of fifty-one years.

POST-MORTEM EXAMINATION.

The autopsy was performed by Professor J. B. Cleland on July 31, 1941. The following notes summarize the main findings in the general viscera:

... bruising and oedema of upper part of the oesophagus. Oedema and congestion of lungs with a number of small haemorrhages. Bronchi and lower trachea congested. Small necrotic (amoebic) foci in the caecum. Group of small cysts in liver. Quartz pebble more than 1" in diameter in stomach.

Death was attributed to the suffocating effects of filling his mouth with food and rubbish, the quartz pebble perhaps as well leading to bruising and oedema of the upper part of the oesophagus.

Pathological Examination.

Macroscopic Examination.

The brain weighed 1,276 grammes (the normal weight of the brain of a male, aged fifty-one years, is 1,320 grammes [Weil⁽⁹⁾]). The right and left cerebral hemispheres appeared equally affected. The most striking feature was a severe atrophy of the frontal and temporal lobes, together with the insula, characterized by much shrunken, biscuit-coloured gyri separated by deep gaping sulci. The most affected areas included the medial, superior, middle and inferior frontal gyri, the *gyrus cinguli* (except a small area posteriorly), the *gyrus rectus*, the anterior, posterior, medial and lateral orbital gyri, the gyri of the insula, the superior, middle and inferior temporal gyri, and the anterior halves of the medial and lateral occipito-temporal gyri. In the remainder of the brain mild, diffuse atrophy was apparent.

On section, the grey matter of the frontal region was thinner than normal. In parts of the temporal region both grey and white matter were extremely shrunken. In both frontal and temporal lobes the basal surface was most affected. The *cornu Ammonis* was shrunken, grey and translucent. The *globus pallidus* was somewhat shrunken and brownish in colour. The caudate nucleus was brownish and very much smaller than normal. There was a moderate degree of dilatation of the lateral ventricles, especially in the anterior and the inferior horns; the third ventricle was also slightly dilated. In places the walls of the ventricles were granular.

The vessels of the circle of Willis were free from atheroma. The meninges had been removed from the surface of the brain, and it is not known whether or not they were thickened.

Microscopic Examination.

Meninges and Cortex.—Remnants of the pia-arachnoid overlying the involved areas were found to be much thicker than usual, especially in the temporal region. Examination under the low power of the microscope of sections stained by the Nissl method showed that the most obvious changes were a profound derangement of cortical structure, including narrowing of the width of the cortex, considerable diminution of the number of nerve cells, subpial gliosis, and, in places, lack of clear-cut demarcation between grey and white matter. The degree of involvement of the affected areas was extremely variable, even in the extent of a single gyrus. Occasionally the intensity of the pathological process was such that there was almost total loss of the nerve cells of all cortical layers. Usually, however, the process was of moderate intensity, and then to a certain degree it manifested a selective affinity for certain cortical laminae. For the most part the third and to a lesser degree the fifth and sixth layers were more affected than the second and fourth (granular) laminae. However, this did not always hold; occasionally the second layer was involved as much as or more than the third lamina.

Under the high power of the microscope, degenerative changes in the remaining neurones, such as mild chromatolysis, or shrinkage and intense staining of the cytoplasm together with nuclear eccentricity, were sometimes observed; these, in part, could be attributed to post-mortem degeneration. Neuronal swelling, as described by earlier authors, did not occur.

There was a moderate diffuse increase in the number of fibrillary astrocytes throughout the cortex. In a few places, however (for example, the anterior portion of the fusiform gyrus), gliosis was absent; here the cortex was "spongy". Astrocytic hyperplasia was pronounced in the molecular layer, and led to the laying down of a patchy, dense meshwork of glial fibres in the subpial tissues. There was a tendency also for glial fibres to be laid down around the blood vessels.

In sections stained with Scharlach R, occasional swollen microglial cells containing lipid were seen in the perivascular spaces and were also scattered throughout the cortex. In addition, a moderate increase in lipid was noted in a number of nerve cells.

Senile plaques, Alzheimer's neurofibrillary changes or argentophilic inclusion bodies were not observed. Occasional nerve cells, however, appeared to stain more deeply than usual with silver.

In sections stained for myelin sheaths, occasional demyelination of the tangential fibres in the most affected areas was present, and less frequently in the bands of Baillarger. The radial fibres were also slightly involved.

In the cortex immediately subjacent to the *pia mater* many amyloid bodies were demonstrable; they were patchy in distribution and were most apparent in the depths of the sulci and in the vicinity of blood vessels. To a certain extent, the number of amyloid bodies present was proportionate to the severity of the pathological process; in severely affected areas they were many layers thick, and occurred not only in the molecular layer, but also in the outer granular lamina. Less often they were detectable in all cortical laminae.

In addition to the above-mentioned changes, a few vessels with mild perivascular cuffing were noted in the cortex.

White Matter.—Pronounced demyelination was present in the temporal gyri, the insula and the anterior commissure. In the frontal lobe, on the other hand, demyelination was mild and diffuse, and it was most apparent in the deeper part of the *centrum semi-ovale*, in the *corpus callosum*, and in a number of the gyri. By contrast, the pyramidal tracts and the white matter of the occipital lobe were not appreciably affected.

Astrocytic hyperplasia was noted in the white matter; its severity was proportionate to the degree of demyelination. In the most severely affected areas a dense feltwork of glial fibres was laid down. Where the changes were less severe, occasional "glial nodules" occurred.

As in the case of the grey matter, vessels with mild perivascular infiltration were observed; they were particularly evident in the *corpus callosum*.

A few scattered compound granular corpuscles containing lipid occurred in the white matter, mainly in the perivascular spaces. The relatively small amount of lipid demonstrable in the brain was considered to be indicative of a lesion progressive over some time rather than a sudden destructive one.

Basal Ganglia.—Of all the areas of the cerebrum involved by the pathological process, the caudate nucleus was the most severely affected. In the extremely atrophic nucleus a few degenerated neurones were found, together with a pronounced gliosis. Many of the astrocytes appeared to be swollen. There was also some increase in the number and in the size of the microglial cells, some reaching the stage of compound granular corpuscles. Lying in these cells, and also in the astrocytes, granules of bluish, greenish and yellow-brown pigment were to be found in sections stained by the Nissl method. Considerable quantities of pigment were also demonstrable outside the cells. The fibre bundles had almost disappeared. There was a slight decrease of nerve cells in the *globus pallidus*, associated with a moderate to severe sclerosis. In the putamen degeneration of some of the fibre bundles was demonstrable.

Ventricles.—In the walls of the third and lateral ventricles many amyloid bodies were observed. These were associated with gliosis leading to a dense feltwork of fibres in the subependymal region. Mild perivascular cuffing of a few vessels was also present. The granularity of the ventricular walls was probably due to puckering resulting from atrophy of the underlying brain.

Chorioid Plexus.—Occasional hyaline degeneration of vessels of the chorioid plexus occurred, with a tendency to calcification. This finding was normal for the brain of a man aged fifty-one years.

Blood Vessels.—There were no appreciable lesions of blood vessels.

DISCUSSION.

From a consideration of the clinical history and pathological findings in the case described, several points of interest emerge.

In the majority of cases reported, the age of onset varied between forty-five and seventy years, so that the onset of the disease at forty-eight years in the present case was typical. Cases have been described, however, in which the disease began as early as twenty-one or as late as eighty years of age (Löwenberg, Boyd and Salom).

The average duration of the disease is from four to six years, with upper and lower limits of two and a half and twelve years respectively. In the present instance death occurred by accident at the end of three years.

As far as could be determined, the family history was irrelevant. It is often difficult, however, to obtain an admission with regard to insanity in a family.

For the most part the psychiatric picture and aphasia were similar to those described by previous authors. An outstanding feature, however, was the restlessness, which persisted unrelieved throughout the three years of illness. This was considered to be a "release" phenomenon due to destruction of higher controlling centres. A preliminary phase of restlessness occasionally occurs in Pick's disease, but, according to Kinnier Wilson, usually passes in the course of time into a stage of inertia. Restlessness of such long duration must certainly be unusual.

The fear and anger occasionally exhibited were obviously primitive manifestations. The patient's habit of stuffing his mouth with rubbish was probably a manifestation of the "Atz" or "feeding" reflex of Schmitz and Meyer.⁽¹⁰⁾ The variability in the degree of clouding of consciousness of the patient, which occurred in the earlier stages of the disease, is typical of an organic syndrome. Although mental defect was always well marked, memory, perception and orientation in time and place were apparently better on some days than on others. In addition, it should be noted that the signs and symptoms exhibited were those of a degeneration. Though the dissolution was relatively rapid, there were no irritative signs at any times.

The main features of the pathological picture were similar to those described by previous investigators. It may be mentioned, however, that cell infiltration (Schneider⁽¹¹⁾) and argentophilic inclusion bodies (Urechia and Danetz⁽¹²⁾), considered by some almost pathognomonic of the disease, were not found in the present case. Similarly, they were not present in all but one of the four cases described by Löwenberg, and in the case reported by Hassin and Levitin.

The theories with regard to aetiology have been reviewed critically by McMenemey, who, while admitting that the exact nature of the disease is obscure, inclines to the view that the disease is a heredo-degeneration. The most recent theory is that of Hassin and Levitin, who consider that the pathological changes bear a great resemblance to those which result from the prolonged administration of "Metrazol". They suggest, therefore, that Pick's disease is due to a chronic intoxication. Further work is necessary in order to decide this question.

Diagnosis of the disease depends on the clinical picture (Goldstein and Katz⁽¹³⁾), but encephalography, biopsy and angiography are useful adjuvants (Benedek and Lehoczy⁽¹⁴⁾).

SUMMARY.

The clinical and pathological features of a case of Pick's cerebral atrophy are described.

ACKNOWLEDGEMENTS.

We are indebted to Dr. H. M. Birch, Superintendent of Mental Institutions, for permission to publish this case, to Professor J. B. Cleland for the autopsy notes and pathological material, and to Professor E. Weston Hurst for helpful criticism and advice.

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Reviews.

THE X-RAY TREATMENT OF INFECTIONS.

A RECENT publication by James F. Kelly and Dr. Arnold Dowell entitled "Roentgen Treatment of Infections" is the first text-book we have seen devoted exclusively to a field of radiotherapy, the value of which is not generally appreciated.¹ One can think of no one better fitted to write such a book than Dr. Kelly; he is an authority on the subject, and started years ago to treat the more serious acute infections at the bedside with a mobile therapy apparatus.

This book of over 400 pages is excellently produced with many diagrams and illustrations and contains all the scientific and clinical material essential to the subject. It will thus be of interest to physician, surgeon and radiologist alike.

As in most books on radiological subjects, the first part deals with X-ray physics and fundamentals.

Part II, dealing with general considerations, is particularly good in that it sets forth honestly the status of X rays in the treatment of infections, and answers successfully the sceptics who would still refuse the empirical use of such a powerful agent in grave infections. It is admitted that no precise scientific explanation has been universally accepted regarding the exact mode of action of the radiation on the tissues or the invading organism; but when the method has been given a fair trial under proper conditions, a great reduction in morbidity and mortality has been secured in several infections of the acute fulminating variety. Numerous cases are quoted in detail to illustrate the dramatic clearing of toxæmia, the return to normal of swollen discoloured crepitant limb tissues, the avoidance of amputation after the administration of X-ray therapy.

The authors have evolved the use of a mobile X-ray therapy unit so that patients need not be moved to the X-ray department and they believe it is an indispensable adjunct to any modern general hospital. The doses used are very small, and if dosage measurement is accurate and proper precautions are used, no harm can follow from the application of the rays. An earnest plea is made for the use of X-ray therapy in war wounds both prophylactically and in the treatment of established gas gangrene.

Gas bacillus infection is discussed in detail from the pathological, clinical, diagnostic and therapeutic points of view. The use of serum is dealt with in a special chapter, the most impressive fact which emerges being that X rays have repeatedly been effective after prophylactic and therapeutic use of serum had not checked progress of the disease.

The greater use of X-ray films in the diagnosis of gas gangrene infection is advocated, as the demonstration in

¹ "Roentgen Treatment of Infections", by J. F. Kelly, M.D., F.A.C.R., with the collaboration of D. A. Dowell, M.D.; 1942. Chicago: The Year Book Publishers, Incorporated. Medium 8vo, pp. 432, with 122 illustrations and 25 tables. Price: \$6.00 net.

damaged tissues of an amount of gas which increases in a few hours can be taken as positive evidence of the infection. On the other hand, the mere presence of the typical organisms does not mean an active gas bacillus infection; nor does the demonstration of gas in the tissues.

Many other medical men throughout the United States of America have contributed to the statistical review of cases of gas gangrene treated by X-ray therapy, and it is stated that no case has been included in which there was no evidence of toxæmia, nor has any been excluded because of death. The study covers 364 patients treated up to May, 1940, 303 of whom had involvement of an extremity. Of the total patients, 322 lived, the mortality rate being 11.5%, and of the 303 cases with limb involvement, therapeutic amputations were performed in only 66. A further 44 patients in whom gas gangrene infection complicated diabetes or arteriosclerosis were also treated, and of those 17 lived. These figures must be considered in association with several reports on the combined use of surgery and serum from well-known surgical clinics in which the average mortality is of the order of 35%.

It is concluded that when X-ray therapy is used, amputation is unnecessary during the acute invasive stage of the disease, except for immediate removal of tissue damaged severely by the injury. Better results, it is said, are obtained if the use of sulphanilamide and allied drugs is avoided during the administration of X rays.

Similar beneficial effect of X rays has been obtained in acute peritoneal infections, particularly acute spreading peritonitis following appendicitis, which according to many is due to the same group of organisms as that found in gas gangrene. X-ray therapy is recommended as an aid before and after operation, and on comparison of two groups of patients, one treated with X rays and the other without, the mortality is seen to be reduced to less than half in the group which had received radiation.

Experimental work on the value of X-ray therapy for gas gangrene infection in animals has not shown as good results as those obtained clinically, but there may be other explanations for this and it does not detract from the clinical results.

Other infections in which X-ray therapy is advocated are surgical mumps, erysipelas, carbuncles, Ludwig's angina and pneumonia.

There is no doubt of the honesty and sincerity throughout this book; and it should certainly be read by those engaged in treating the wound infections met with in military and industrial surgery.

The book concludes with an extensive review of the literature and the opinions previously expressed are supported by a bibliography of nearly 200 references.

ANÆSTHESIA AT SEA.

A SMALL volume entitled "Anæsthetics Afloat", by R. Woolmer, is intended for naval and merchant service medical officers, whose opportunities for regular practice in anæsthesia are naturally few, and who are unfamiliar with modern, yet easily acquired, resources in this important field.¹ It can be said at once that it succeeds admirably in its purpose. The author is a specialist anæsthetist who has apparently recently spent some time at sea with the Royal Navy. In the opening chapter he points out the folly of making too casual a preliminary examination of the patient, a practice unfortunately all too common. He cites the discomfort of the anæsthetist who finds a recent tooth socket at the conclusion of a difficult anæsthetic, not knowing whether the tooth has been removed before or during the anæsthesia! He strongly favours the combination of "Omopon" (one-third of a grain) and scopolamine (one one-hundred and fiftieth of a grain) as the best form of premedication for standard use, preceded by "Nembutal", a grain and a half, the night before. He emphasizes the necessity of spare bottles and ampoules in a rolling ship or near struggling patients in a small sick bay or cabin. He gives satisfactory descriptions of the use of "open ether", ethyl chloride and chloroform-ether sequences.

¹ "Anæsthetics Afloat", by Surgeon Lieutenant-Commander Ronald Woolmer, R.N.V.R., B.A., B.M., B.Ch. (Oxon), D.A., with an introduction by Surgeon Captain H. D. Drennan, D.S.O., R.N.; 1942. London: H. K. Lewis and Company Limited. Crown 8vo, pp. 130, with 18 illustrations. Price: 6s. net.

At sea, the doctor is often single handed, and in such circumstances the use of intravenous injections of barbiturate for anæsthesia and spinal anæsthesia are comforts of the first order. "Evipan" and "Pentothal" administration are ably described, and their chief uses outlined. In particular, the author recommends the naval surgeon to have one or two syringes loaded with one of these solutions when the ship prepares for action. Wounded men, entangled in steel work or in great pain, can by this means be freed and transported with the minimum of pain and shock, and an operation completed in the sick bay. The section on nitrous oxide is probably superfluous, but that on spinal anæsthesia is excellent, and is enhanced by a number of helpful illustrations. The author advises "Stovaine" as a hyperbaric anæsthetic and mentions "Percaïne" only as a light and hypobaric solution, whereas Australian anæsthetists use it widely in a 1:200 strength, by the hyperbaric technique. The many advantages of spinal anæsthesia for urgent surgery upon the lower part of the abdomen at sea can be heartily endorsed. In tropical latitudes maintenance of adequate anæsthesia by "open ether" is a task requiring great patience and experience. Even if two medical officers are available, they are better employed at the field of operation and its immediate precincts than at the patient's head, especially under sea-going conditions. Local anæsthesia is discussed in a further chapter, and this has a special application to single-handed surgery. Further chapters deal in a rather digressive manner with post-operative complications; there is a rather too short section upon anæsthesia in relation to war wounds, injuries and shock, and finally there is a very good description of the use of Magill's intratracheal tube, which can also be used for exsufflation of the nearly drowned, with subsequent administration of oxygen.

While a knowledge of anæsthesia, like many other things, cannot be acquired from books, yet nevertheless here is a small, quickly readable monograph which deserves a place in every naval medical officer's cabin, and contains tips of value to medical officers of other services, doctors who may have to deal with air raid casualties, and lone practitioners in isolated districts.

A TEXT-BOOK OF PATHOLOGY.

THE fifth edition of Muir's "Text-Book of Pathology" has made a welcome appearance.¹ Though a considerable amount of new information is included, the volume has been increased very little in size; this has been made possible by deleting portions of the text from the fourth edition which was published in 1936.

Speaking generally the mode of presentation has not been altered greatly, but some rearrangements have been adopted. For example, whereas in the fourth edition the first chapter was concerned with disturbances of nutrition, and was followed by a chapter on disturbances of the circulation and two chapters on inflammation, in the fifth edition the chapters on disturbances of the circulation and on inflammation come first and are followed by the chapter on disturbances of nutrition.

Many new illustrations have been included, some of them larger than those in the original text. The paper is better than that of the fourth edition; it is whiter and has a more glossy surface, the effect being to make the illustrations clearer and to enhance their value.

The same emphasis is placed on the distinction between arteriosclerosis and atheroma as hitherto. A cautious attitude is adopted in regard to reticulosis and reticulosarcoma. Though the author believes that an understanding of principles and an analysis of the chief pathological processes and diseases are of more importance for the student than the acquisition of knowledge about rare abnormalities, nevertheless accounts of comparatively uncommon conditions that have received special attention in recent medical literature are included in the work; as an example regional ileitis may be cited. An adequate description of regional ileitis is accompanied by a photograph showing its gross features.

There seems to be no point in our going into further detail; suffice it to state that the latest edition worthily maintains the high reputation this standard text-book has enjoyed since it first appeared in 1924, and is a credit to author and publisher alike.

¹ "Text-Book of Pathology", by Sir Robert Muir, M.A., M.D., Sc.D., LL.D., F.R.S.; Fifth Edition; 1941. London: Edward Arnold and Company. Medium 8vo, pp. 999, with 599 illustrations. Price: 35s. net.

The Medical Journal of Australia

SATURDAY, AUGUST 22, 1942.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

FOOD SHORTAGE AND CHILD HEALTH.

SHORTAGE of some of the essential foods is one of the inevitable accompaniments of modern war. We know that in some of the countries overrun by the enemy food of all kinds has become so scarce owing chiefly to the machinations of a relentless enemy that people are dying of starvation day by day in their hundreds. In Great Britain much of the food has been rationed, but in Australia, though from time to time certain types of food become scarce, rationing has not yet been introduced to any great extent. When food becomes scarce the effect is most pronounced on children and is likely to be felt first by them. No time need be wasted on the contention that if a nation is to be virile and to retain its place in the struggle for existence, its growing children must have healthy bodies and healthy minds. This they cannot do if their food is deficient in amount or if it is greatly lacking in the accessory food factors known as vitamins or in essential minerals. At the same time it may perhaps be well to emphasize once again in the words of Robert Hutchison¹ that nutrition and its relation to health is a more complicated matter than is often realized and that there is no subject which more requires cool and clear thinking. Hutchison holds that in addition to inability to get enough food of the right kind, under-nutrition or malnutrition is due to such factors as lack of appetite, the consequence of urban and indoor life, educational strain among children, and infective disease in early life, recovery from which has never been complete. There are also, he contends, wear and tear and psychological factors. Sir George Newman had much the same sort of idea when he connected nutrition with the "total well-being and right functioning of the whole body". The first point which we would make and which should perhaps be the last, is thus the fact that the provision of food in ample quantity and of the most desirable quality is not of itself sufficient to assure the proper nutrition of

children. It is, however, a fundamental requirement. We are not at the moment concerned primarily with the relative importance of what we may call the adjuvant factors. We have to see that the right food is available, for we know that unless we do, dire results will surely follow. For this reason there is considerable interest in the fact that a discussion on the effect of wartime rationing on child health has taken place at a meeting of the Royal Society of Medicine.²

Before the report of the recent discussion is considered it is advisable to recall the recently considered Ministry of Health report (see THE MEDICAL JOURNAL OF AUSTRALIA, July 11, 1942) in which the health of the children of Great Britain was presented in a favourable light. Some of the facts revealed were most encouraging—for example, the statement that there has been a vast increase in the consumption of milk by the classes who need it most, and also the setting up of numbers of day nurseries. The Ministry of Health report does not cover the whole subject of wartime rationing and school health and we therefore turn to the Royal Society of Medicine discussion. Unfortunately most of the speakers were able to speak only in terms of personal impressions and not of observations based on statistics. In spite of this the views expressed were interesting, for, if nothing else, they show the lines along which Australians should think and work. E. M. Widdowson referred to the dietary habits of "middle class children". She said that the rations provided children up to eight years of age with as much meat, bacon, sugar and jam as they were having before the war. Children of over eight years of age were formerly eating more of all of these foods and adolescents had eaten two to three times as much as their present ration provided. The average pre-war intake of butter was more at all ages than a ration of two ounces a week; on the other hand the mean consumption of cheese had always been very much less than the present weekly allowance of three ounces. Widdowson suggested that in spite of the dietary restrictions to which older children had had to submit, appetite and instinct would have led them to maintain their calories by an increased consumption of bread, potatoes and other plentiful foods. The adolescents' loss of protein, iron and vitamin B, brought about by the rationing of meat and bacon, could, she thought, be readily made good by an increased consumption of national wheatmeal or wholemeal bread. So long as these children received their full domestic milk allowance, together with one-third of a pint of school milk every day, and if they ate their full ration of cheese, she saw no reason why the calcium intake of school children should fall below the corresponding pre-war figures. However, the calcium available for boys and girls who left school at fourteen or fifteen years of age might be inadequate. If margarine was vitaminized so that it was equal to summer butter, children up to the age of twelve years could obtain more of the fat-soluble vitamins from their present rations than they had from the same foods before the war. If the margarine was not vitaminized, these children would get less of these vitamins at all ages above one year. Widdowson concluded by saying that vitamin C intake had been severely curtailed as a result of shortage of fruit, but it was not known whether this was a serious matter or not.

¹ The Lancet, March 14, 1936.

² Proceedings of the Royal Society of Medicine, February, 1942.

Widdowson based her remarks on a survey of 1,000 middle class children, made in the period 1935-1939. Helen M. M. Mackay took her to task for not having mentioned eggs, fish, rabbit, chicken and other forms of unrationed meat, all of which had figured largely in the pre-war diets of children, but were now in short supply. Though Mackay spoke only on the basis of information gained by the questioning of mothers, she had a much less reassuring picture than Widdowson had given. She said that some wives of service men could not afford to buy their share of available foodstuffs, and distribution had often been uneven. She thought that liquid milk had up to the time of the meeting (November, 1941) provided an outstanding example of unsatisfactory distribution in children's homes. Moreover, some schools provided no milk and children spent their halfpence on sweets, and so got no school milk even when it was available. Mackay expressed the opinion that more official figures should be available, and she gave her reasons for thinking that tuberculosis was increasing, that nutritional anemia had increased considerably during the last two years and that some increase in the number of cases of rickets had taken place. She also mentioned one observation which must be true of many localities, and that is the tendency for the mother to give most of the rationed food to the father. This is easily understood, for the majority of men are working harder today than they have ever worked. Mackay then made the surprising remark that the working-class mother, with all her handicaps and lack of scientific knowledge, often fed her children better than did the hospital or residential institution for children. For this reason she believed that hospitals and institutions needed constant supervision. J. A. Glover said that it was his impression that neither the health, nor the nutrition, nor indeed the spirits of the elementary school children had deteriorated. The school child had started this war a bigger and better nurtured child than his predecessor of 1914, who on the whole had improved during the last war. He then made the wise remark that it was impossible to disentangle the effects of rationing from those of the many other abnormal factors which had influenced child nutrition in wartime. Professor A. St. G. Huggett pointed out that the treatment and care of the infant began before birth and that development *in utero* was ultimately dependent on the food supply of the mother. He mentioned a cut in the ration which had just been made and said that in the ration as then allowed some of the essential constituents (he enumerated them) were on the border line and others were below the generally accepted minimal requirements. He therefore expected to find later on certain signs of malnutrition in children.

This short account of the opinions expressed at the London discussion shows how difficult it is to be certain that the rationing of food is having a bad effect on the health of children. To begin with, at the outbreak of war the nutrition of the children in a community will not be uniformly high, and slight deviations from what would be regarded as normal are not easy to discover. Moreover, nutritional defects do not appear in children tomorrow as a result of a deficient diet given today. The delay that must take place before a poor diet can have its bad effect is the most dangerous of all the factors concerned in malnutrition. For this reason the statements of Professor Huggett are very disturbing. When, as

we must do, we bring the question nearer home and think of Australian conditions, we have to remember that we started the war with a relatively healthy child community and that very little real shortage of essential foods has occurred. Again, owing to the good climatic conditions and the outdoor life lived by most Australian children, nutritional defects will not make their appearance as soon as they would in other, less fortunate, countries. We know what the constituents of children's diets should be, and though people are always inclined to eat what they like and not what they should, there ought not to be much difficulty. Nor will there be difficulty if a long-sighted policy is adopted. It may be that transport problems will cause trouble; these must be faced with a knowledge that essential foods are more important to the community than many other products which have to be moved from place to place. And it may be remarked incidentally that in the "zoning" of food deliveries there is a constant need to be watchful that quality does not suffer as a result of an absence of competition. Tea is not essential to the health of children; but the recent rationing of tea by the Commonwealth authorities has shown that the low wage earner now receives his share of tea, whereas before rationing he had to contend with the better-off member of the community who could buy larger quantities of tea and buy them often. The conclusion of the matter is that when it becomes clear that an essential article of diet is likely to be scarce, rationing should be introduced unannounced and without delay so that every member of the community may have his share.

Current Comment.

PROGNOSIS OF MENTAL INSTABILITY UNDER SERVICE CONDITIONS.

PSYCHONEUROSIS and mental instability, manifesting themselves under Service conditions, and leading directly to non-effectiveness or discharge, already constitute an enormous problem throughout the Empire at war. Much has been done in an attempt to eliminate the psychologically unfit on recruitment particularly in the United States of America, where a *questionnaire* carefully designed to search for psychoneurotic trends must be answered on enlistment. Even if it were practicable, however, for every recruit to be submitted to a lengthy examination by a trained psychiatrist, even one with extensive service experience behind him, many individuals, at first classed as fit for active service, would break down mentally after their first experience of enemy action. Physicians, concerned with the selection of men for active service, or with those who have been broken in mental health by the whirl of war, are eagerly awaiting guidance in these problems and, in particular, in the problem of prognosis.

It is as yet far too soon to speak with authority upon the ultimate outlook for such unfortunate sailors, soldiers or airmen. The fruits of the last World War, and such statistics from large clinics as have already been printed, are minor indications which can assist in foretelling the direction, if not the distance, of the answer. Stephen Barton Hall and Muriel Barton Hall, of Liverpool,¹ have attempted to correlate an experience of over 1,500 young people of both sexes, between the ages of ten and twenty years, referred for investigation of mental, nervous or allied disorders, with that obtained from a study of a series of over 330 consecutive young soldiers suffering from war neurosis. They believe that since many of the former or peace-time adolescent group have now qualified for the

¹ *The Lancet*, March 28, 1942.

latter or Service group, some deductions of prognostic value may be expected. They enumerate the following factors as the chief blows to mental equanimity when the change over takes place: "the severing of marital and parental relationships, the necessity for adaptation to a communal life characterised by a certain noisiness, roughness and coarseness; the discipline, restriction of liberty, adoption of subordinate roles, irksome parades and inspections inseparable from Army routine, unaccustomed heavy exertion, and the rigours of enemy action". The civilian adolescents fell into three almost equal classes: the psychotics and defectives, the psychoneurotics, and those suffering from behaviour disorders due to mental conflict. In the military cases the conditions were nearly all of the second class, that is, psychoneurosis, but the misfortune of embodying a proportion of mental defectives in the modern army has recurred in the present campaign. The frankly bad prognosis in such material is too well known to require further emphasis, and the results of S. and M. Barton Hall are a replica of many previous similar reports. Two grades of psychoneurosis were encountered in soldiers, the recoverable and the chronic. The soldier with the recoverable form is able eventually to return to the military unit. These were relatively few. In the chronic cases there was a long history of phobias, depressions and inferiorities extending well back into childhood which quickly rendered void such altruistic emotions as patriotism; and those affected must usually be discharged as unfit. Their subsequent progress depends in part upon the effort, including their own, which is made to rehabilitate them quickly into a useful and absorbing occupation. Even under peace-time conditions various reports have shown that only about a quarter are wholly restored after three years and able to meet fresh difficulties without relapse. Such results in carefully treated civilian cases under peace-time conditions augur badly for the prognosis of the young psychoneurotic under conditions of war service. Thus Sutherland (1941) reported only 9% as fit to return to full duty after treatment at a neurosis centre. He stressed their basically shiftless attitude towards the outside world, manifested in excessive dependence on their families, with whom alone they felt secure. Many such constitutional psychopaths have found their way into the Australian Services, and have broken down under the trivial stresses of Navy and Army life long before they were assayed in the fire of violent action. Of two extreme types, that which exhibited behaviour disorders, corresponding to those of adolescent delinquency, has a more favourable prognosis than the more common group due to congenital psychopathic inferiority.

The paper by H. R. Love, published in this issue, shows how important the occurrence of neurosis in the field can be. Clearly the question of prophylaxis is of the utmost importance. This has been discussed on previous occasions in these pages and attention must again be drawn to what Love writes in this regard. The weeding out of unsuitable men at the preliminary examination and during training must be continually carried out. After this the heavy burden of responsibility falls upon the regimental medical officer or his corresponding colleague in the Navy and Air Force, who alone can work prophylactic magic in his unit, if he is so inspired and so instructed. Love makes this quite clear. It is not an exaggeration to say that the very first words which the regimental medical officer addresses to a potential or actual psychoneurotic may determine the state of that individual's mental health for the next few hours or the next few years. The results of allowing a sailor or soldier to learn at once that he is suffering from "an anxiety state" can be appalling. Overcompensation by a psychoneurotic has deceived many a recruiting officer, and in spite of every care, large numbers of psychopaths will find their way into battle. The experience may even benefit some, but the experiment has proved too costly for frequent repetition. Ideally the recruiting officer and the regimental medical officer should be taught such psychiatry as we know to be pertinent and true. From both a Service and national point of view it is possibly more important to recognize an actual or potential

psychopath, than to be able to recite the steps of a dozen surgical operations. But recruiting officers and regimental officers cannot be everything that is expected of them by arm-chair critics. There are efficient and inefficient "R.M.O.'s", even as there are good and bad soldiers and sailors. We can have no doubt that the Service chiefs are aware of this and that they use the efficient members of their units to the best advantage while they do everything possible to make the not-so-efficient improve their efficiency.

RHEUMATIC DISEASES UNDER WAR CONDITIONS.

DURING the "blitz" on London last year, when the civilians were disturbed nearly every night and were obliged to spend the night in cold and often damp shelters, it was not surprising that this mental and physical stress tended to initiate rheumatic conditions in those susceptible to them or to aggravate those conditions if they were originally present. What is perhaps more surprising is that these conditions were not more common. The increase in patients presenting themselves at the London clinics with rheumatic conditions is explained by Oswald Savage¹ by the relative vulnerability of rheumatic patients to short sleep and to cold, and by the fact that because of the vast national effort there is a large percentage of the population which has changed to more vigorous occupations. For instance, women have undertaken jobs usually done by men, and many of them have taken up regular work for the first time, with the result that unaccustomed muscles have been brought into use. The lengthened hours of work necessitated by the increased production and by "A.R.P." duties also may be expected to have a deleterious effect on rheumatic patients. Of the rheumatic patients those with osteoarthritis have been most affected by the factors mentioned. Patients with the rheumatoid type of arthritis have been affected in one of two ways; either their condition has been improved and their mind occupied by the extra work or else they have been adversely affected psychologically with the appearance of many new lesions or the occurrence of many relapses. The majority of rheumatic conditions which Savage has seen in London since the onset of the war have been those generally classed as fibrositis, either occupational or environmental. The former class has been due to muscle strains, particularly in the forearms and thighs, and the patients have complained of pains referred to the regions of the wrist and knee joints. The underlying pathology is probably a small tear in the muscles. Such cases respond to the injection of a local anaesthetic into the affected area followed by remedial exercises. In the environmental class the trapezii and glutei muscles are chiefly affected. This is caused by sitting with the shoulders against a damp wall, or on stone floors, or on damp cushions. The pain from the involved trapezii is often referred to the neck or to the occiput, while gluteal involvement is revealed by pain down the back of the thighs similar to that of sciatica. In these cases there is a diffuse tenderness on palpation over the affected muscles; the pain is not increased by movement; and relief may result from the application of heat followed by massage or from ionization with histamine.

Savage also describes a new clinical syndrome, "shelter feet". This consists of painful oedema of both feet due to sleeping in a sitting position, often in a deck chair, with the knees flexed, and is the result of impaired venous return. Cure consists in sleeping in a horizontal position. It appears that the shelters of London are steadily being improved, and this should do much to alleviate the suffering of these patients. There is, however, a large psychological element in rheumatoid arthritis, and while the sufferers from this disease should benefit from improvement in the shelters, greater improvement is to be expected when the war has been won and life in shelters becomes unnecessary.

¹ *Annals of the Rheumatic Diseases*, June, 1941.

Abstracts from Medical Literature.

RADIOLOGY.

The Radiological Aspect of Gastritis.

F. R. BURDORF (*British Journal of Radiology*, January, 1942) describes the radiological and gastroscopic appearances of the various forms of gastritis. He states that it is possible to discover radiologically that gastritis is present, but with the exception of the chronic verrucose form it is impossible to state the type. Radiologists estimate the functional changes in the mucous membrane, while gastroscopists see the living appearance of the inner surface. Radiologists and gastroscopists thus view the subject from quite different angles. The failure to appreciate the facts that the X-ray and gastroscopic pictures are different aspects of the same condition, and that a different picture may be obtained at the two examinations, has resulted in the quite erroneous and extreme view that radiology is of little value in the diagnosis of gastritis. Moreover, radiologists examine the mucosa while it is in a state of "resting relief"; gastroscopists employ an inconstant amount of distension. In the stomachs of dogs it is possible to produce a gastroscopic picture identical with that of atrophy by means of over-inflation, and by the use of a high degree of distension vessels have been seen in normal human stomachs. The radiological study of gastritis has in the past been discredited owing to a lack of appreciation of the functional formation of the relief. Attempts to explain large and small rugae on the basis of hypertrophy and atrophy should not be made. This does not mean that large folds are not hypertrophied, but simply that it is not possible to tell whether they are or not.

A New Method of Foreign Body Localization.

ALFRED A. LORIMER (*American Journal of Roentgenology*, February, 1942) describes a new method of foreign body localization. The geometrical principles of this method are compared with those of the Strohl wire method or its modifications. Since the ratio relations of relatively large triangles are utilized in the application of this method, as compared with the smaller triangle relations which govern the calculations of the Strohl method, it is believed that basically this new method provides for a greater degree of accuracy than the Strohl method. Errors due to variations in position of the focal spot of the X-ray tube are discussed; geometrical calculations indicate that they would be inappreciable. Other "uncontrollable variables", such as warping of the "Bakelite" support for the fluoroscopic screen, corrugations in the screen itself (as might be expected in hot weather) and parallax are cited. To compensate for all these variables, an adjustable reading level has been incorporated. This provides for the subtraction of the "plus" or "minus" errors by their

inclusion with the value of the spacing between the skin and the fluoroscopic screen. The method thus provides for a direct and basically accurate calculation of depth—a calculation as to depth, not beneath the level of the fluoroscopic screen as is usually considered, but actually beneath the surface of the skin of the patient. The localization procedure should require less than forty-five seconds, and the röntgen-radiation exposure received by the patient should not exceed 15 r. Mention is made of an accessory item, a biplane marker, which serves to mark the skin in the vertical plane, thus providing for two-plane localizations, as might be accomplished by biplane röntgenoscopy.

The X-Ray Findings in Increased Lead Absorption due to Retained Projectiles.

HYMAN R. SENTURIA (*American Journal of Roentgenology*, March, 1942) states that there are certain changes which may take place in the appearance of projectiles which have been retained in the body for a varying period of time and that these changes can be demonstrated by X-ray examination. They consist of diffusion, infiltration, and saturation of the adjacent tissues by lead particles. These changes have been associated with clinical and laboratory evidence of increased lead absorption, which had progressed in some cases to signs and symptoms of severe chronic lead intoxication. Projectiles lodged in bone adjacent to an active joint have shown these changes more consistently than those situated elsewhere in the body. This is apparently very significant and it has been suggested that the constant motion of the joint surfaces furnishes a destructive friction responsible to a great extent for the disintegration of the bullet. Projectiles which remain embedded in soft tissues have not been known to show these changes; they soon become encapsulated and innocuous. What part, if any, the synovial fluid plays in the solution of the lead is not known and would seem to warrant further investigation. Those projectiles such as infantry shot or shrapnel which consist for the most part of lead, are more likely to result in disintegration and absorption than grenade fragments or aerial bomb splinters which consist mainly of steel. In civil life the greatest number of wounds would result from small arms, and the lead content of these is very high.

Ossification of Vertebral Ligaments.

ALBERT OPPENHEIMER (*Radiology*, February, 1942) states that the occurrence of bone hypertrophy condensation and osteophytes is never a primary reaction, but is always consecutive upon rarefaction. An initial traumatic rarefaction comes into play when vertebrae adjacent to a thinned disk receive continual mechanical injury owing to the loss of thickness and elasticity of their natural buffer. Minute but repeated fractures occur at these vertebral edges. The injured vertebral bone responds by a reaction which corresponds to callus formation in other bones. In the thoracic and lumbar vertebrae the ventral margins are more frequently and more easily traumatized than the dorsal margins, since in these regions forward flexion

is a more common and less limited movement than backward extension. In the cervical spine, both the ventral and dorsal edges are exposed to trauma when the disk is thinned, since both flexion and extension are free in the neck. Osteophytes may fail to form when the bone does not respond by hypertrophy to the trauma, for example, in old age. But if the vertebral bone does respond, osteophytes arise from the ventral margins of lumbar and thoracic vertebrae, and from both margins of the cervical vertebrae, because of the mechanical conditions above set forth. New bone is incapable of growing across normal connective fibres. Only in the annular area extending from the edge to the attachment of the longitudinal ligament is the vertebra devoid of a ligamentous covering. In this place, the ligament does not adhere to the vertebra, and there is an empty triangular space between the vertical vertebral surface, the inner layer of the longitudinal ligament and the fibres which connect the latter with the disk. New bone arising from the vertebral body can grow into this space until it meets the ligamentous fibres which bound it. As the disk grows flatter, the ligament becomes looser and the triangular space larger; simultaneously the traumatism becomes stronger and more frequent. Accordingly, the osteophytes grow larger as the disk thinning progresses. Calcification and ossification of vertebral ligaments, occurring in the course of many different vertebral lesions, are uncharacteristic reactions, not typical of any particular disease, and should not be confused with arthritis. The vertebral ligaments may calcify or ossify when, in the presence of vertebral rarefaction, their tension and mobility are diminished. The ligaments play no active part in the formation of vertebral osteophytes. In the presence of calcified or ossified ligaments vertebral mobility is normal, unless the apophyseal joints or the vertebral bodies are diseased simultaneously.

Duodenitis.

G. R. MATHER CORDNER (*British Journal of Radiology*, February, 1942) states that the radiographic appearances in duodenitis consist of (a) variations in the amount and character of the surface secretion, (b) alterations in the mucosal relief pattern, and (c) changes in the consistence of the mucosal folds. Normally, the presence of secretion on the mucosal surface of the cap cannot be recognized radiologically. Mild degrees of inflammatory exudate are difficult to recognize, but exudation of high degree is obvious. A high degree of exudation appears to dilute the contrast medium as it passes through the cap and causes a veiling of the mucosal surface so that it is seen as through a mist. The exudate interferes with the intimate contact of the medium and the mucosal surface, and the satisfactory demonstration of the mucosal relief is invariably difficult in these cases. The presence of inflammatory exudate causes an alteration in the slipperiness or stickiness of the mucosal surface, depending upon the fibrin content of the exudate. The more recent acute forms of duodenitis have a slippery secretion and the mucosa loses its adhesive property. The contrast medium flows rapidly over the mucous membrane as though over a

highly varnished surface. In the older and more chronic lesions, the adhesive property of the mucosa is increased. The opaque medium flows more slowly through the cap, and one has the impression that the mucosal surfaces are sticking together and are being slowly separated from each other. The contrast medium sticks better than usual to the mucosal surface and has a fine granular appearance. One of the most important signs in duodenitis, because it is so frequently observed, is a broadening and thickening of the mucosal folds, with a corresponding broadening of the hollows between the folds. The broadening and puffing up of the folds are not by themselves sufficient evidence to justify a diagnosis of duodenitis. For this it is essential that the folds show changes in their consistence. The pathologically altered folds show a loss of flexibility and a decrease of movement on palpation, and they are less easily deformed and smoothed out by pressure and by stretching. Occasionally, the stiffening of the folds is so pronounced that they appear to be rigid, anatomical structures, and it is only with the greatest difficulty that they can be obliterated by pressure. When superficial ulcers occur, the predominant picture is that of the inflammatory and not of the ulcer lesion. Such ulcers heal rapidly, and may or may not leave a scar which is visible radiographically. The radiographic evidence of such scars usually disappears completely in a month or two. In many of these cases the changes of duodenitis persist, and the patient still has symptoms, even after the ulcer has healed. One has the impression that the duodenitis is the essential lesion in these cases, and that the ulcer is merely an incident in the course of the disease.

Post-Traumatic Painful Osteoporosis.

L. G. HERRMANN, H. G. REINEKE AND J. A. CALDWELL (*American Journal of Roentgenology*, March, 1942), in order to avoid all confusion with atrophy of bone due to inactivity or disuse, emphasize the view that true osteoporosis is the type of atrophy of bone that is characterized by a patchy demineralization of the bones of an extremity in which there are coexisting signs of vasomotor instability, trophic changes in the soft tissues, and usually severe visceral pain. The importance of post-traumatic painful osteoporosis as a major cause for prolonged loss of function or severe aching pain after trivial as well as serious injury to an extremity is not generally recognized, and, as a result, many innocent persons are unjustly accused of malingering or of being grossly uncooperative simply because their disability continues long after the effects of the original trauma have subsided or after the broken bones have had a chance to become firmly united in good position. Post-traumatic osteoporosis is always characterized by: (a) partial loss of motor function of the affected part; (b) mild to severe vasomotor and trophic changes in the affected extremity; (c) spotty demineralization of the bones near the site of trauma; and (d) mild to severe aching pain in the extremity. The disturbances of function are always more extensive than can be explained on the basis of the trauma alone, and the aching pain in the extremity is greatly out of proportion to the local

signs of injury to the tissues. The course of post-traumatic painful osteoporosis can be greatly shortened and most of the serious complications avoided if the disease is recognized in the acute phase and treated by thorough denudation of the main artery to the affected extremity (periarterial sympathectomy).

PHYSICAL THERAPY.

Evaluation of Short Wave Diathermy.

R. KOVACS (*Archives of Physical Therapy*, December, 1941) attempts to evaluate as far as possible in the present state of knowledge the clinical results and scope of applicability of short wave diathermy. Short wave therapy is a convenient, flexible and comparatively safe physical measure for deep tissue heating. Much investigation has been carried out on the mode of action of short wave diathermy in the tissues, but apart from the possibility of specific electrical changes, thermal effects are the only proved biophysical effects of this method of therapy. The general clinical applicability of short wave diathermy corresponds closely to that of long wave diathermy and includes subacute and chronic inflammatory conditions of deeper tissues and organs. Short wave diathermy offers some unquestionable advantages in its technique over long wave diathermy. Firstly, the principle of air spacing has made the treatment possible over bony prominences and irregularities and over wounds and ulcerated areas. Secondly, the development of the method of coil field heating makes possible the efficient heating of the soft parts of an entire limb. A definite drawback to the technique of short wave diathermy at the present time is the lack of guidance to dosage other than that supplied by the patient's sensation. There appears to be a special field of applicability of short wave diathermy in some acute inflammatory and purulent conditions of the skin and possibly of some internal organs.

Pneumoperitoneum as an Aid in Pelvic Irradiation for Carcinoma of the Cervix Uteri.

L. R. SANTE (*American Journal of Roentgenology*, November, 1941) points out that the radiosensitivity of normal structures has always been the limiting factor in radiation therapy. This is especially true of carcinoma of the cervix uteri. In these cases, the operation of the inverse square law leads to the rapid falling off of radiation from the radium applied in the cervical canal and vagina, so that little reaches the parametrial tissues. To supplement further the radium dosage delivered into the parametrium, deep X-ray therapy is given both externally and in recent years intravaginally. The days of massive doses of X-ray therapy given in a short time have shown that the intestinal mucosa is radiosensitive, though this is less evident with the methods of fractionating the dose now in use. Any method then by which the intestines can be removed from the field of irradiation should be desirable. The author has attempted to do this by the

induction of pneumoperitoneum. The patient is then placed in the Trendelenburg position, so the air rises in the pelvis, envelops the pelvic structures and displaces the intestines to the upper part of the abdomen. The patient is kept on her back in bed for the first day or so after induction of the pneumoperitoneum until she becomes accustomed to the presence of air in the abdomen. Air is used, since large amounts of this gas usually require from ten to fourteen days for complete absorption. The technique of outlying and angulation of the fields of treatments is described in detail. The procedure has been carried out in relatively few instances, but it has been noted that although treatment has been given daily, nausea and vomiting did not occur if the intestines were properly displaced from the pelvis. To insure this the bowels must be kept empty by means of enemata and there must be sufficient air in the abdomen. Rectal tenesmus and diarrhoea did not develop. It also seemed to be a fact that the local skin reaction for the same dosage of X rays, measured in air, was less than when the intestines with their contents occupied the pelvis.

Milestones in Actinic Therapy.

It is stated in an editorial in *Archives of Physical Therapy*, March, 1942, that it is less than half a century since Finsen's epoch-making work "Medical Employment of Concentrated Chemical Rays of Light" appeared. Finsen's clinical and laboratory studies brought recovery to thousands of victims of *lupus vulgaris* and became a powerful impetus for the therapeutic employment of artificial sunlight containing a predominance of ultra-violet radiation. Hildebrinsky, of Berlin, first published a statement in 1919 that irradiation of a rachitic child with ultra-violet rays would bring about a cure. Further experimental work led not only to the recognition of vitamins A and D, but also to the widespread utilization of the antirachitic potency of irradiated foodstuffs. Some of the extensive laboratory research stimulated by these discoveries is now being directed towards the problem of formation of other vitamins by photosynthesis. The bactericidal action of light on a mixture of organisms encountered in putrefying substances had been discovered as early as 1862 by Downes and Blunt. When Finsen first treated skin tuberculosis with his carbon arc lamp, he was of the opinion that the results were due to the bactericidal action on tuberculosis germs in the depths of the skin. We know now that the penetration of ultra-violet rays is restricted to the first two millimetres of the skin or less and that the principal factor in Finsen therapy was the well-localized inflammatory reaction. Only in comparatively recent times has it been shown that the maximum bactericidal effect of ultra-violet rays is in the spectral zone of between 2,960 and 2,100 Ångström units, and that generators emitting an almost monochromatic radiation of 2,537 Ångström units can be successfully employed for surface sterilization of foods, certain pharmaceutical products and the air. Today radical diminution of air-borne infection in operation rooms and the production of barriers of ultra-violet rays for the prevention of cross infection in hospital rooms are an established fact.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on May 21, 1942, at the Royal Prince Alfred Hospital, Sydney. The meeting took the form of a number of clinical demonstrations by members of the honorary medical staff of the hospital.

Coarctation of the Aorta.

Dr. N. C. CUNNINGHAM showed a man, aged twenty-four years, with coarctation of the aorta. He discussed the etiology of this condition, and said that it was quite often compatible with a long and useful life. The narrowing of the aorta took place at or near the entrance of the *ductus arteriosus*, and it was considered by some to be due to an extension of the obliterative process, which closed the ductus, into the wall of the aorta. As it occurred below the origin of the left subclavian artery, the blood pressure in both upper limbs was frequently raised, whilst the femoral pulses were usually absent. The blood from above the obstruction found its way back to the aorta below by various anastomotic channels.

The patient shown had been perfectly well until five years earlier. He had played football, had indulged in rowing, skating and swimming, and had won a bicycle race from Penrith to Sydney at the age of eighteen years. He had had occasional cyanosis after swimming. His mother said that he was refused an anaesthetic as an infant, because of a "bad heart". His first symptom was an hæmoptysis five years prior to the meeting, and he had not really been well since, although he had played strenuous tennis for the next three years. There was no history of rheumatic fever, scarlet fever or diphtheria.

On examination, the patient was found to present a typical picture of coarctation of the aorta, as well as having mitral stenosis and auricular fibrillation. His heart was enlarged and the apex beat was in the anterior axillary line, in the sixth intercostal space six and a half inches from the midline. A presystolic thrill and murmur were present. The heart was fibrillating. The blood pressure was 120 millimetres of mercury, systolic, and 70 millimetres, diastolic, in both arms. The femoral pulses were not palpable. The right lateral thoracic artery was much enlarged, palpable and pulsating. X-ray examination revealed a large heart, with considerable erosion of the ribs close to the costo-vertebral junction due to greatly enlarged intercostal arteries.

Webbed Fingers.

Dr. BEN DENNING showed a male child, aged five weeks, who had complete webbing of the lateral three fingers of the left hand. The palmar aspect presented a continuous, smooth, skin surface; but on the dorsum, the groove between the fingers was very well marked between the middle and ring fingers and less well marked between the ring and little fingers. There was no diminution in size in the affected fingers, as was frequently the case in such congenital abnormalities. Dr. Denning said that the best time to operate in such cases was at the age of about three years. When three fingers were involved, the operation should be performed in stages, with at least one month in between. Operation in infancy was rarely successful, because of the difficulty of operating on such small parts, and because of loss of blood from the flaps and often the loss of vitality of the flaps. The main difficulty of operation was that if the flaps were too thick, injury to the vessels, nerves and tendons was likely, and if the flaps were too thin, they sloughed. Unsuccessful operation left the patient in a worse state than before, because of the scarring and contraction of the fingers. In bad cases skin grafting was useful, but it was difficult on account of the age and restlessness of the patient.

Diaphragmatic Hernia.

Dr. Denning's second patient was shown by courtesy of Dr. Eric Fisher. She was a female, aged forty-four years, who had previously been shown at a Medical Board meeting before her operation. About ten years earlier, the patient began to have a feeling of fullness and discomfort and sometimes pain after meals. This usually came on immediately after meals, but was sometimes delayed for as long as four hours. The patient would make herself vomit

and so obtained relief. Breakfast was the only meal she could retain. The vomitus consisted of large quantities of watery fluid and was sour towards the end; it never contained bile and seldom contained undigested food. She had lost a considerable amount of weight recently, and on examination she was found to be very thin. No abnormality could be detected in the abdomen on palpation.

A barium meal examination showed that the whole of the stomach was situated in the right side of the chest and was completely inverted. The three portions of the duodenum were stretched out into one straight line from the opening in the diaphragm, vertically downwards to the duodeno-jejunal junction. The stomach reached as high as the third rib.

A laparotomy was performed by Dr. Eric Fisher. The œsophagus was found to be pulled well over to the right side, and as soon as the abdomen was entered it disappeared again into the right side of the chest through a right para-œsophageal opening. The duodenum emerged in close contact with the œsophagus, and there was no part of the stomach in the abdominal cavity.

Both portions of the bowel were adherent to the opening in the diaphragm. The adhesions were separated and the stomach was pulled down into the abdomen. The opening in the diaphragm was then seen to be about 1.5 inches in diameter. It was closed with kangaroo tendon. The stomach was allowed to drop into its natural position.

The X-ray picture taken three weeks after the operation showed the stomach to be in its normal position and functioning normally. In the five months since the operation the patient had increased in weight from seven stone to eleven stone and felt better than she had ever felt before.

Mikulicz's Disease.

Dr. Denning next showed a male patient, aged seventy-one years, who had first come under observation six months earlier on account of a lump in the floor of the mouth, which had been present for four months. The lump was about one inch in diameter and was in the right sublingual gland. It was freely movable, but seemed to be attached to the muscles of the floor of the mouth. It caused some difficulty in speech and excessive salivation; it was not tender. Moderate enlargement of the right submandibular gland was present.

During the following six weeks, the lump in the mouth increased tremendously in size, crossing over the middle line until its dimensions were eventually two inches by one inch by three-quarters of an inch. At the same time both submandibular glands increased in size, presenting firm, rubbery swellings projecting one and a half inches below the mandible. A biopsy showed the swelling to be composed mainly of connective tissue and lymphocytes; the condition was reported to be Mikulicz's disease.

The patient was given a course of deep X-ray therapy, 1,600 r being delivered to each side; doses of 400 r were delivered alternately to each side every day. The X-ray treatment was completed six weeks before the meeting. The submandibular swellings had entirely disappeared and there was only a small fibrous thickening, representing a previous enlargement of the submandibular gland.

Cirrhosis of the Liver and Cholecystitis.

Dr. Denning next showed a male patient, aged seventy-three years, who 32 years earlier had been operated on on two occasions for hydatid cyst of the liver. Since then he had had recurrent attacks of jaundice and epigastric pain, which "doubled him up". The pain was fairly continuous and radiated into both loins. The attacks lasted for several days and the stools were pale during the attacks. For several years the attacks occurred about twice a year; but during the last year they had become much more common and now occurred about every three weeks, and there had been very little respite from the jaundice during the last six months. The patient had lost some weight recently, although he had always been thin. He had never had urticaria, and had lived in the city all his life.

On examination, some tenderness was present in the right hypochondrium, and liver dullness extended about two inches below the costal margin on the right side. No other tumours were palpable. The history strongly suggested the presence of a hydatid cyst with periodical leaking into one of the main bile ducts and the passage of hydatid debris down the bile duct, causing temporary obstruction. However, all tests for hydatid disease gave negative results. No hydatid elements had been found in the stools. Neither the Casoni test nor the complement fixation test produced a reaction, and a blood count revealed 23,000 leucocytes per cubic millimetre, without eosinophilia; the erythrocytes numbered 3,500,000 per cubic millimetre. Laparotomy sub-

sequent to the meeting failed to reveal a hydatid cyst. The liver was cirrhotic and enlarged; the gall-bladder was also enlarged, and contained several stones and a considerable amount of biliary debris. The cystic duct was quite small, and more of the biliary debris was found at the lower end of the common bile duct, causing partial obstruction.

Diverticulitis and Renal Calculi.

Dr. Denning then showed a skiagram of a female patient, aged sixty-two years, revealing two advanced pathological conditions of different origin. The skiagram, which had been taken after a barium enema, revealed pronounced diverticulitis of the sigmoid colon, and numerous small diverticula were easily seen. In the same film were to be seen large branched staghorn renal calculi in both kidneys. The patient's symptoms were passage of large quantities of urine, persistent dull pain in both loins and occasional passage of blood from the bowel.

Dermoid Tumour of the Abdomen.

Dr. Denning finally showed a skiagram of a male patient, aged fifty-two years, who had a large solid tumour in the left renal area. The tumour was fixed and somewhat tender. The skiagram showed that the tumour contained a large number of small calcareous shadows, but that the left kidney had been pushed upwards and outwards. A ureteric catheter was pushed up the left ureter and was seen to travel laterally around the circumference of the tumour on its way to the displaced kidney. X-ray examination after the injection of sodium iodide showed the kidney to be normal in size and shape. The report on the films was that the tumour was a dermoid tumour of the abdomen. Subsequent laparotomy revealed a very hard tumour embracing the abdominal aorta and fixed to the posterior abdominal wall. Its operative removal was completely impossible.

Acute Suppurative Labyrinthitis and Basal Meningitis.

DR. GARNET HALLORAN showed a female patient, married, aged fifty-eight years, who on April 28, 1942, had been admitted to hospital suffering from acute suppurative otitis media on the right side, paralysis of the right labyrinth and meningismus. Right earache had begun five days previously, followed three days later by aural discharge, vertigo and vomiting. On her admission to hospital, no evidence of mastoiditis could be found, and her severe earache had decreased; she complained rather of generalized headache.

Examination of the ear revealed, not only acute suppurative otitis media, but also acute diffuse suppurative labyrinthitis, as evidenced by total deafness of the right ear, vomiting (which had ceased), vertigo and rotatory nystagmus towards the left side. Severe meningismus, generalized headache and mental dulness suggested the onset of basal meningitis. Incontinence of urine was present. The clinical picture was complicated by the presence of a left-sided hemiplegia, but no history could be obtained as to the date of its onset. The possibility of an acute temporal lobe abscess large enough to involve such areas was highly improbable in an infection of such short duration. Moreover, the fundi showed no evidence of intracranial pressure. It was later found that the hemiplegia had appeared two years previously. Culture of the thick aural pus resulted in a pure growth of hemolytic streptococci. As was to be expected from the nature of the bacteriological culture, the aural discharge diminished rapidly after administration of "M & B 693" ("Dagenan").

On April 28 treatment with "Dagenan" was begun, one gramme being given every four hours. After five days (25 grammes had been given) it was discontinued for two days, and then resumed in the same dosage for seven days. The dosage was then halved for another four days. A total of 60 grammes was administered over the seventeen days. On April 30 lumbar puncture was performed, after 14 grammes of "Dagenan" had been administered; the cerebro-spinal fluid was clear and sterile, and the pressure was 70 millimetres; the cell content had increased to 30 per cubic millimetre, the chloride content was 760 milligrammes per centum (normal) and the total protein content was 20 milligrammes per centum (normal).

On May 3 a total of 25 grammes of "Dagenan" had been administered, and the drug was then discontinued for forty-eight hours. On May 5 the cerebro-spinal fluid was turbid, but sterile; the pressure was 70 millimetres; the cell content had increased to 3,500 per cubic millimetre, 90% being polymorphonuclear cells; the chloride content was 690 milligrammes per centum (normal) and the total protein content was 100 milligrammes per centum (increased).

On May 8 an additional 20 grammes of "Dagenan" had been administered. The cerebro-spinal fluid was clear and sterile; the pressure was 40 millimetres; the cell content had diminished to 430 cubic millimetres, 60% being polymorphonuclear cells.

On May 11 an additional eight grammes of "Dagenan" had been administered. The cerebro-spinal fluid was clear and sterile; examination of a smear revealed pus cells in moderate numbers; the chloride content was 700 milligrammes per centum (normal) and the total protein content was 40 milligrammes per centum (diminishing). The great increase in total protein content and in the number of polymorphonuclear cells in the cerebro-spinal fluid on May 6 occurred after the discontinuance of "Dagenan" for forty-eight hours, and may be regarded as evidence of considerable tissue destruction in the central nervous system. The temperature also rose from normal to 101.6° F. on that day, but had fallen to normal for the three days including May 11, corresponding with the fall in total protein and cell count of the cerebro-spinal fluid. The administration of "Dagenan" was discontinued on May 14, a total of 60 grammes having been given. Between May 1 and May 14 the number of leucocytes in the cerebro-spinal fluid ranged between 12,600 to 25,900 per cubic centimetre.

On May 9 cortical mastoidectomy was performed. Although none of the classical signs of acute mastoiditis were present, it was thought that these were masked by the saturation with "Dagenan". Skiagrams revealed considerably more opacity in the mastoid cells than usually accompanied acute suppurative otitis media, and it was thought that an exacerbation of the mastoid infection would occur on withdrawal of the drug. At operation the mastoid process (including the tip cell) was found to be filled with oedematous mucosa, but no free pus was found. The meninges and lateral sinus were not exposed. The patient's general condition continued to improve, the meningismus being lost by May 18. Complete deafness of the right ear and nystagmus directed away from the lesion remained as evidence of total destruction of the labyrinth.

Post-Nasal Carcinoma.

Dr. Halloran also showed a male patient, aged forty-nine years, who had been admitted to hospital on April 14, 1942, complaining of a post-nasal discharge of eighteen months' duration and of considerable nasal obstruction. Occipital headache had persisted for one year. He complained of earache and deafness on the left side.

Examination revealed greatly enlarged cervical glands on both sides. The earache and deafness were due to obstruction of the Eustachian tube. Bulging of the post-nasal wall was present, extending across the mid-line to the left fossa of Rosenmüller. The forward bulge of the tumour was almost in contact with the posterior edge of the hard palate, accounting for the nasal obstruction. The tumour was not bony hard and was not ulcerated. A cervical gland was later removed by Dr. Eric Fisher. Microscopic examination of a section of the lymph node revealed secondary carcinoma; the appearance was consistent with a primary lesion arising from modified squamous epithellum.

The patient was submitted to deep X-ray therapy. The primary tumour and the cervical glands proved to be very radio-sensitive, and shrank considerably, with consequent relief for symptoms. Dr. Halloran said that the length of time for which the relief would continue, and what metastases were already present elsewhere, were problematical.

(To be continued.)

Special Correspondence.

NEW ZEALAND LETTER.

FROM OUR SPECIAL CORRESPONDENT.

CONDITIONS throughout the Dominion continue to become more difficult for medical men in practice. With the introduction of Social Security (General Practitioner) Benefits in 1941 there has been a considerable increase in the demand on doctors' services, though it cannot in any way be said that the public have been unreasonable. On the contrary, they have shown remarkable patience with the difficulties under which the doctors remaining in civil practice are

working. These are increased through the absence overseas of so many men and the heavy demands made by the Services within New Zealand. Not only are many practitioners withdrawn from practice, but the whole burden of hospital care and almost all the military boarding are thrown on the remaining practitioners. During the winter the prevalence of minor infectious diseases has added considerably to the strain.

No major reorganization of general medical services in the large towns has yet been attempted, although a fair degree of publicity has been given to the difficulties. A cooperative system for serving night calls has been begun in Auckland.

In the main hospitals strain is being felt, particularly owing to the numbers of military patients and depleted personnel. Again no major reorganization of hospital services, either as a whole or within the individual hospitals, has been made. Evidences of maladaptation, however, are frequent in the daily Press. Tension between hospital authorities on the one hand and Health Department and/or medical staffs on the other is in evidence in more than one hospital.

Regulations have been prepared and gazetted recently empowering the Minister for Health to take direct control of hospitals under certain conditions. These conditions were numerous, and referred to matters such as failure of Boards to provide accommodation required by both current and extraordinary needs, failure to appoint sufficient staff, behaving in an improper fashion *et cetera*. No case has yet occurred in which these regulations have been invoked, but an occasional chairman has been witnessed gingerly trying the cap on. These regulations, though precipitated by the unusual conditions prevailing, also signify what is regarded by many to be an inevitable trend towards central Government control of the New Zealand hospitals instead of that by the present forty-two locally elected hospital boards. Since Social Security, of course, the central Government has been finding a greater and greater proportion of the money required for hospital maintenance. Commonly it is 75%, and this, together with the widely publicized demands from the local bodies that the Government should maintain wholly the soldiers in public hospitals, renders some change in the direction of greater Government control more likely.

The New Zealand Formulary.—This war edition of "The New Zealand Formulary", published under the direction of the Minister for Health, has just appeared and is a very useful guide to practitioners from all points of view. War-time shortages and the limits of the drug tariff under Social Security are well set out, and the resulting formulæ are the best available. Not much is available under the heading "The Endocrine Section", but under "The Vitamins" a better selection, though not a complete one, is obtainable.

X-Ray Services.—The regulations under which X-ray services are available under Social Security by private radiologists have also been circulated, together with a list of those radiologists who have "full" recognition (whole-time specialists) and those who have "partial" recognition (those who practise other branches of medicine as well). Roughly speaking, 50% of the fee in a standardized scale is payable by the Government, the remainder being found by the patient.

Correspondence.

THE WAR, QUININE AND THE MEDICAL PROFESSION IN AUSTRALIA.

Sir: This letter is being courteously submitted in the sincere hope of such a rational control of drugs by the appropriate Control Committee that words such as those used in the leading article of THE MEDICAL JOURNAL OF AUSTRALIA of August 1, 1942, namely, "... every medical practitioner must understand the criminal folly of using quinine for any other purpose than to secure its specific action in the prevention or treatment of malaria", could never appear in print to embarrass and irritate medical practitioners.

"Quinine is used from time to time by many practitioners in obstetrical emergencies and some other non-malarial conditions in which equal results may be obtained with other remedies" is a sentence towards the end of the leading article.

If it is "criminal folly" ("words ... not too strong") to use quinine in the medical induction of labour, it will be helpful to medical practitioners to have for reference an official account in the Journal of the other remedies "by which equal results may be obtained".

It is submitted, Sir, that the words "criminal folly" are "too strong", when there has been in the leading article no account of these other remedies.

The usual combination of castor oil and a salt of quinine in the medical induction of labour is, in the words of "Herman's Difficult Labour", a "method that has much to recommend it. There is no liability of sepsis, no fear of rupturing the membranes or separating the placenta, no necessity for an anæsthetic" and gives such satisfactory results that it is not easy to be convinced that "equal results may be obtained with other remedies".

The thanks of medical practitioners will be due to THE MEDICAL JOURNAL OF AUSTRALIA if it will: (a) authoritatively list the other remedies to be used with equal results in the medical induction of labour, (b) help to achieve a more satisfactory control of drugs than is obvious now, (c) use less provocative words than "criminal folly" in its application to medical practitioners who are striving to cooperate with professional and national leaders in the present time of peril.

Yours, etc.,

R. J. JACKSON.

Armidale,
New South Wales,
August 4, 1942.

[With a full knowledge of the effect of the shortage of quinine on the military situation of the Commonwealth and of the events which have caused this shortage, the statement is repeated that those who use quinine for any other purpose than to secure its specific action in the prevention or treatment of malaria, are guilty of criminal folly. It is not unlikely that the safety of Australia will ultimately depend on the ability of the medical authorities to control malaria. In regard to the "more satisfactory control" of drugs, it must be pointed out that the Medical Equipment Control Committee is doing its duty; it appeals to the practising members of the profession to take their share in the control of drugs—it makes no appeal without just reason. There is no need to give details of "other methods" for the induction of labour. When proper care is shown their use is justified. At the present time with the small danger attendant on the use of these "other methods" on the one hand and the grave danger to the whole country on the other, there can be no doubt about the proper course of action. Let us have no criminal folly.—EDITOR.]

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 215, of August 6, 1942.

AUSTRALIAN MILITARY FORCES.

Australian Imperial Force.

Australian Army Medical Corps.

The undermentioned officers are seconded in their units of the Citizen Military Forces, and are appointed to units of the Australian Imperial Force as from the dates and in the ranks indicated, with regimental seniority in accordance with their army seniority in the Australian Military Forces:

To be Captains.—Captains (provisional) VI48226 B. J. Robinson and H. L. Tonkin, 18th May, 1942.

The following changes *et cetera* are made.

Captain VX332 A. E. Raine is transferred and is seconded, 12th May, 1942.

Captains NX70472 G. R. Jones and NX70456 A. C. R. Sharp are transferred, 30th April, 1942, and to be Majors (temporarily), 4th June, 1942.

To be Lieutenant-Colonels.—Majors (Temporary Lieutenant-Colonels) J. B. Colquhoun, J. M. Dwyer and W. P. MacCallum, D.S.O., M.C., 26th January, 1942.

To be Majors (temporarily).—Captains H. O. Lancaster, 26th January, 1942, E. J. C. Molesworth, M.C., E. A. Hedberg and N. P. Wilson, 31st January, 1942.

Captain T. H. Ackland relinquishes the temporary rank of Major, 29th January, 1942.

Major C. R. Blomfield ceases to be seconded and resumes regimental duty, 20th January, 1942.

The undermentioned officers are transferred from reinforcements from date shown: Captains H. H. McLennan and M. Goldman, 18th September, 1941.

Colonel SX4844 F. H. Beare, E.D., is transferred and is appointed a Deputy Director of Medical Services, 15th April, 1942.

Lieutenant-Colonel A. H. Green relinquishes command of a Field Ambulance, is transferred, is appointed to command a General Hospital and to be Colonel (temporarily), 14th April, 1942.

Captain (Temporary Major) SX1467 G. T. Gibson is transferred and retains the temporary rank of Major, 11th April, 1942.

Major SX11016 T. D. Hannon is transferred and to be Lieutenant-Colonel (temporarily), 17th April, 1942.

Captain NX474 M. S. Alexander is transferred and to be Major (temporarily), 15th April, 1942, and is again transferred, and retains the temporary rank of Major, 1st May, 1942.

Captain NX76363 H. B. Gatenby is transferred, 23rd April, 1942.

Major NX454 A. F. Hobson is transferred, is appointed to command a Field Ambulance and to be Lieutenant-Colonel (temporarily), 23rd April, 1942.

Major NX70330 A. J. Murray is transferred and to be Lieutenant-Colonel (temporarily), 23rd April, 1942.

Major VX14854 C. A. M. Renou is transferred and to be Lieutenant-Colonel (temporarily), 23rd April, 1942.

Captain J. Summons is transferred, 23rd April, 1942.

Lieutenant-Colonel VX14686 D. J. Thomas is transferred, 23rd April, 1942.

Captain NX70923 K. S. Wallace is transferred, 23rd April, 1942.

Captain C. C. Wark is transferred, 16th April, 1942.

Captain SX10449 J. M. Pedler is transferred, 16th April, 1942.

Major VX142 C. H. Johnston is transferred, 11th April, 1942.

Major SX5270 M. S. Joyner is transferred and to be Lieutenant-Colonel (temporarily), 17th April, 1942.

Captain NX70229 J. Z. Huie is transferred, 15th April, 1942.

Captain (Temporary Lieutenant-Colonel) J. B. McElhone is seconded in Active Citizen Military Forces for service with the Australian Imperial Force, is transferred with seniority in accordance with his Army seniority, and retains the temporary rank of Colonel and is appointed to command a Hospital Ship, 11th April, 1942.

Captain NX475 J. L. Holme is transferred, is appointed to command a Light Field Ambulance and to be Major (temporarily), 15th April, 1942.

Lieutenant-Colonel NX1168 R. H. Russell, D.S.O., is transferred, is appointed an Assistant Director of Medical Services and to be Colonel (temporarily), 14th April, 1942.

Major VX14749 S. Plowman is transferred, is appointed to command a Light Field Ambulance and to be Lieutenant-Colonel (temporarily), 14th April, 1942.

Major (Temporary Lieutenant-Colonel) VX224 M. A. Rees is transferred, is seconded and retains the temporary rank of Lieutenant-Colonel, 12th June, 1942.

Major L. M. Outridge is transferred, is appointed to command a Field Ambulance and to be Lieutenant-Colonel (temporarily), 23rd April, 1942.

Major VX223 T. G. Swinburne is transferred, is appointed to command a Casualty Clearing Station and to be Lieutenant-Colonel (temporarily), 14th April, 1942, and is again transferred to command a Casualty Clearing Station and retains the temporary rank of Lieutenant-Colonel, 21st May, 1942.

Major WX1526 H. M. Trethowan is transferred and to be Lieutenant-Colonel (temporarily), 14th April, 1942.

Captains VX16384 H. E. Rowe and NX456 A. G. Rowell are transferred, 7th May, 1942.

Lieutenant-Colonel NX335 J. W. H. Skinner is transferred, 15th April, 1942.

Major NX181 G. N. Young is transferred and to be Lieutenant-Colonel (temporarily), 15th April, 1942.

Lieutenant-Colonel VX199 E. S. J. King is transferred, 15th April, 1942.

Major QX6264 W. E. Langford is transferred, is appointed to command a Casualty Clearing Station, and to be Lieutenant-Colonel (temporarily), 14th April, 1942.

Majors NX70280 M. P. Susman and QX6069 H. R. Love are transferred and to be Lieutenant-Colonels (temporarily), 3rd June, 1942.

Major WX3459 R. G. Williams is transferred, is appointed to command a Convalescent Depot and to be Lieutenant-Colonel (temporarily), 14th April, 1942.

Major WX10 J. H. Stubbe is transferred, is appointed to command a Casualty Clearing Station and to be Lieutenant-Colonel (temporarily), 17th April, 1942.

Major VX165 S. W. Williams is transferred and to be Lieutenant-Colonel (temporarily), 3rd June, 1942.

Lieutenant-Colonel NX451 S. H. Lovell from command of a Field Ambulance, is transferred, is appointed an Assistant Director of Medical Services and to be Colonel (temporarily), 23rd April, 1942.

Lieutenant-Colonel WX1528 L. G. Male from command of a Field Ambulance, is transferred, is appointed a Deputy Director of Medical Services and to be Colonel (temporarily), 23rd April, 1942.

Major (Temporary Lieutenant-Colonel) J. B. D. Galbraith relinquishes command of a Light Field Ambulance, is transferred, is appointed to command a Convalescent Depot and retains the temporary rank of Lieutenant-Colonel, 14th April, 1942.

Captain NX34937 D. G. Perrett is transferred and to be Major (temporarily), 1st May, 1942.

Captain WX11107 L. P. Gray is transferred, 23rd April, 1942.

Captain (Temporary Major) NX228 T. J. White is transferred and retains the temporary rank of Major, 20th April, 1942.

Major WX3325 F. K. Wallace is transferred, is appointed to command a Light Field Ambulance and to be Lieutenant-Colonel (temporarily), 14th April, 1942.

Lieutenant-Colonel N. D. Barton relinquishes command of a Field Ambulance and is transferred, 23rd April, 1942.

To be Colonel.—Lieutenant-Colonel (Temporary Colonel) J. C. Bellisario, 15th January, 1942.

Captain VX65418 R. W. E. Hoyling ceases to be seconded and is transferred from Reinforcements, 15th May, 1942.

To be Major (temporarily).—Captain F. J. B. Miller, 26th February, 1942.

Major NX238 A. F. Janes is transferred from the Permanent Supernumerary List, with regimental seniority in accordance with his Army seniority, 10th January, 1942, is appointed to Command a Light Field Ambulance and to be Lieutenant-Colonel (temporarily), 23rd March, 1942.

The following officers are transferred from Australian Army Medical Corps, Australian Imperial Force, with regimental seniority in accordance with Army seniority and retain the temporary ranks where held:

Captains (Temporary Majors) QX6154 D. G. Croll and is seconded, and WX30 P. C. Thomas and Captains VX64811 B. T. Glanville-Hicks and NX76595 G. G. Cooley, 5th May, 1942.

Captain (Temporary Major) C. H. Gilbert is transferred to a Regimental Supernumerary List, 5th June, 1942.

The following officers are transferred with regimental seniority in accordance with Army seniority: Captains (provisionally) G. A. Cook, 1st May, 1942, N282277 C. M. Swirls, 23rd May, 1942, and W. S. Benwell, 1st June, 1942, G. G. C. McKenzie and F. R. Phillips, 6th June, 1942, F. V. Twohig, 8th June, 1942, A. C. Bell and J. M. Lister, 15th June, 1942.

Major (provisionally) M. Geaney is transferred to the Reserve of Officers and to be Honorary Major, 3rd February, 1942.

The following officers are transferred to the Reserve of Officers and to be Honorary Captains: Captains (provisionally) J. H. Lindell, 29th September, 1941, N. V. Youngman and W. D. Ryan, 3rd February, 1942, and A. J. Macdonald, 1st June, 1942.

Captain (provisionally) N278486 C. L. Bear is retired, 8th March, 1942.

Honorary Captain T. E. Holcombe is appointed from the Reserve of Officers and to be Captain (provisionally), 26th October, 1940 (in lieu of the notification respecting this officer which appeared in Executive Minute No. 231/1940, promulgated in *Commonwealth Gazette*, No. 258 of 1940).

Captain N393352 A. R. H. Duggan is appointed from the Reserve of Officers, 26th May, 1942.

The following officers are appointed from the Reserve of Officers and to be Captains: Honorary Captains P. R. Slater, 1st May, 1942, N280896 N. E. Brand, N393349 V. H. Cumberland and N393350 P. C. P. Waugh, 21st May, 1942, A. R. Magarey, 28th May, 1942, and J. O'Rourke, 1st June, 1942, C. M. Ley, 11th June, 1942, and A. F. Taylor, H. W. Garlick, P. L. McNeill, T. V. Walpole, A. D. Atkinson, R. H. Cowling and P. J. Robinson, 15th June, 1942.

To be Majors (temporarily), and are transferred.—Captains (provisionally) R. R. Winton, 4th June, 1942, and V84855 D. E. Gowenlock, 5th June, 1942, and Captain W. Freeborn, M.M., 8th June, 1942.

Permanent Supernumerary List.

The undermentioned officers are transferred from Australian Army Medical Corps from dates shown: Majors K. S. Richardson, 7th January, 1942, G. N. Young and C. H. Johnston, 21st January, 1942; Captains G. V. Smith, 10th January, 1942, and D. R. C. Wilson, M.B.E., 13th January, 1942.

The undermentioned officers are transferred from the Australian Army Medical Corps from dates shown: Major L. W. Johnston, 23rd February, 1942, and Captain A. M. Johnston, 18th February, 1942.

Active Citizen Military Forces.**Australian Army Medical Corps.**

Captain (Temporary Major) R. G. Penington is transferred, is appointed to command a Light Field Ambulance and to be Lieutenant-Colonel (temporarily), 4th June, 1942.

Captain (Temporary Lieutenant-Colonel) J. A. McGree relinquishes command of a Field Ambulance, is transferred and retains the temporary rank of Lieutenant-Colonel, 21st March, 1942.

Captain F. H. Vincent is transferred, 15th April, 1942.

Captain (Temporary Major) J. Davis is transferred, is appointed to command a Convalescent Depot and to be Lieutenant-Colonel (temporarily), 1st June, 1942.

Lieutenant-Colonel G. B. Bennett is transferred and is brought on the authorized establishment of Lieutenant-Colonels, 2nd July, 1942.

Lieutenant-Colonel T. M. Furber is transferred, 21st June, 1942.

Captain (Temporary Major) D. Zacharin is transferred, is appointed to command a Field Ambulance, and to be Lieutenant-Colonel (temporarily), 5th June, 1942.

Lieutenant-Colonel (Temporary Colonel) F. E. Keane, M.C., relinquishes the appointment of Assistant Director of Medical Services and the temporary rank of Colonel and is placed on a Regimental Supernumerary List, 23rd June, 1942, and is transferred to the Reserve of Officers, 27th July, 1942.

Captain E. C. Smith is transferred, 28th April, 1942.

Lieutenant-Colonel K. J. G. Wilson, from the Retired List, is appointed to command an Australian General Hospital and to be Colonel (temporarily), 14th April, 1942.

Major (Lieutenant-Colonel A.I.F.) T. A. Parry ceases to be seconded for service with the Australian Imperial Force, 13th April, 1942, resumes duty with his unit of the Australian Citizen Military Forces in the rank of Major, to be Lieutenant-Colonel with seniority from 26th June, 1940, is transferred and is appointed to command a General Hospital, 14th April, 1942.

Lieutenant-Colonel E. T. Brennan, D.S.O., M.C., is transferred, 15th April, 1942.

Colonel R. Fowler, O.B.E., V.D., relinquishes the appointment of Deputy Director of Medical Services, is transferred and is appointed to command a General Hospital, 1st May, 1942.

Captain (Temporary Major) W. H. Godby is transferred and retains the temporary rank of Major, 15th April, 1942.

Major (Temporary Lieutenant-Colonel) V84289 L. Harbeck ceases to be seconded, is transferred and retains the temporary rank of Lieutenant-Colonel, 15th April, 1942.

Captain (Temporary Lieutenant-Colonel) H. R. Pomroy is transferred and retains the temporary rank of Lieutenant-Colonel, 23rd April, 1942.

Lieutenant-Colonel W237599 C. H. Terry, O.B.E., E.D., is transferred and is restored to the authorized establishment of Lieutenant-Colonels, 23rd April, 1942.

Lieutenant-Colonel Sir H. G. Smith, V.D., relinquishes command of a Casualty Clearing Station and is transferred to the Regimental Supernumerary List, 21st May, 1942, and is transferred from a Regimental Supernumerary List and is supernumerary to the establishment of Lieutenant-Colonels with pay and allowances of Major, 16th June, 1942.

Reserve Citizen Military Forces.**Australian Army Medical Corps.**

The resignations of Honorary Captains O. W. Bowring, P. J. Bird and W. W. Rall of their commissions are accepted, to date 13th April, 1942, 20th April, 1942, and 24th April, 1942, respectively.

To be Honorary Captains.—John Milroy McPhie, 21st May, 1942, Conrad Michael Ley, 29th May, 1942, William John McKillop, Kenneth John Shellshear, Harold John Winterbotham, 3rd June, 1942, John Douglas Whiteside, Charles Bernays Melville, Kevin John Whitehead and John Charles Squires, 10th June, 1942, William Allen Sanguinetti, Roland John Dallas Park, Carron Ashworth Moore, Ann Jubilee Macleod, Rutherford Kaye Scott and William Russell Rigg, 11th June, 1942.

CASUALTIES.

ACCORDING to the casualty list received on August 12, 1942, Lieutenant-Colonel E. M. Sheppard, A.A.M.C., Adamstown, New South Wales, Captain R. T. Wilkinson, A.A.M.C., Rose Bay, New South Wales, and Captain M. K. Winchester, A.A.M.C., Maitland, New South Wales, are reported to be missing abroad.

Medical Practice.**PROTECTION OF PRACTICES SCHEMES.**

THE General Secretary of the Federal Council of the British Medical Association in Australia has forwarded the following letter for publication.

The President,

The Federal Council of the B.M.A. in Australia,
135, Macquarie Street,
Sydney, N.S.W.

Dear Sir:

Since the receipt of your letter of 22nd ultimo, concerning funds established to safeguard the practices and augment the incomes of members of the professions engaged on war service, it has been decided to amend the Commonwealth law along the lines of Section 132 of the *New South Wales Income Tax Management Act*.

The altered Commonwealth law will apply to payments made to and received from the funds during the year ended 30th June, 1942.

It is expected that the amendment to the law will be made during the forthcoming budgetary session of Parliament.

Yours faithfully,

(Signed) J. B. CHIFLEY,
Treasurer.

Commonwealth Treasury,
Canberra, A.C.T.,
August 4, 1942.

[COPY.]

**New South Wales Income Tax Management Act,
Act No. 48, 1941, Section 132.**

132 (1) Where under the terms of an agreement in writing a taxpayer carrying on a business has undertaken to pay part of the proceeds of his business to the trustees of a fund out of which payments may be made by the trustees to persons carrying on a similar business who are engaged in war service as defined in the Defence Act, 1903, as amended by subsequent Acts, of the Parliament of the Commonwealth, during the present war between His Majesty and Germany and her Allies, the provisions of this section shall apply.

(2) An amount equal to the part of the assessable income of the taxpayer for the year of income which under such agreement is paid to the trustee shall be deemed not to be income of the taxpayer.

(3) The assessable income of any such person for the year of income shall include such amounts as are paid in the year of income to such person by the trustees in pursuance of the agreement.

(4) The trustees shall not, except as provided in this sub-section, be liable to be assessed and taxed in respect of any amounts received by them as payments into the fund during the currency of the present war between His Majesty and Germany and her Allies.

Where, at the close of the year of income within which is published the declaration of peace in the present war, any amount is held by the trustees as part of the fund, such amount shall be deemed to be the net income of that year of income of a trust estate to which no person is presently entitled.

Obituary.**RALPH WORRALL.**

THIS late Dr. Ralph Worrall, whose death was announced recently in this journal, was one whose memory should be honoured on several counts—for his contributions to surgery, his public spirited generosity to the British Medical

Association and his signal service to Sydney Hospital. Though in latter years he was not often seen at medical gatherings, his presence was always more than welcome and he was invariably accorded the respect and deference which were his due. The older members of the profession, particularly, recognized in him an outlook that was far from parochial and a willingness to allow others to have the benefit of his accumulated and wide experience.

Ralph Worrall was born in Ireland. He was a member of a large family and his schooling was irregular and scanty owing to frequent attacks of bronchitis. In spite of his disabilities he was able to study medicine and passed his final examination for the doctorate in medicine at Queen's University, Ireland, in 1878 when he was only nineteen years of age. Within a week of graduation he found himself in charge of a charitable dispensary in Liverpool as *locum tenens*. After this he travelled to Brazil and the River Plate as ship's surgeon in charge of emigrants. After three more voyages to different parts of the world, he arrived back in Liverpool during an epidemic of typhus fever. The medical superintendent of the Mill Road Hospital, who was a college friend of Worrall's, was attacked and died of the disease. The assistant medical superintendent broke down and Worrall slipped into the breach and in recognition of his services was appointed medical superintendent when only twenty-one years of age. After two years in this position he was appointed medical officer and public vaccinator for Everton, Liverpool, with the right of private practice. He began close to the Everton toffee shop where Prince Rupert was supposed to have pitched his tent prior to making an attack on Liverpool. Here he became friendly with William Alexander and it is worthy of record that in later years he introduced the well-known Alexander's operation into Australia. But Worrall's health broke down and he was advised to go to Australia. He arrived in Sydney in 1885 in poor health, without money and without friends. He had letters of introduction, however, to two well-known men who were able to help him—the Reverend J. D. Langley (later Bishop of Bendigo) and D. J. J. Power, of College Street. Within a month of his arrival he was appointed District Medical Officer to the Sydney Hospital, laying the foundation of an association which was to continue till the end of his life. The position carried a bonus of £100 per annum. He then started private practice in College Street and almost at once was appointed medical officer to certain benefit societies. He worked hard and formed a gynaecological clinic for women attending the district dispensary. In this way the directors of Sydney Hospital were brought to see the advisability of establishing a gynaecological department. Applications were called for medical officers to the new department and the late Thomas Chambers and Ralph Worrall were appointed. On the death of Thomas Chambers Worrall was appointed senior surgeon of the department—this was in 1896.

Worrall's influence on gynaecological practice in Sydney and in other parts of Australia was profound. He was senior gynaecologist from 1896 to 1919 and many resident medical officers passed through his hands to carry out his teachings and to practise his methods in distant places. As the years went by his reputation spread and surgeons from other centres came to see his methods and to learn what he had to teach. He introduced aseptic surgery to Sydney Hospital and he revolutionized operating theatre practice. There were, when he started work at Sydney Hospital, no sterilizers for instruments, dishes or dressings and there was no operating table which could be adjusted to provide the essentials for modern surgery. In conjunction with W. Hannam, of Hannam and Company, Worrall designed these things and amongst other innovations he introduced foot taps for use in the theatre. The introduction of radical changes had an influence on the mortality rate from operations and many of the changes introduced by Worrall were adopted in other institutions. Worrall was a careful but quick operator; he was quick, but had no appearance of speed, and care was his natural attribute. His judgement was respected by all with whom and for whom he worked. His attention to detail was as proverbial as it was meticulous, both in the actual performance of operation and in the after-treatment. It has been said that this attention to detail probably had a greater influence for good in surgery than any of his other attributes. He made many contributions to medical literature. One of the most noteworthy was published in the *American Journal of Obstetrics and Gynecology* of December, 1917, under the title "The Technique of Total Hysterectomy for Non-Malignant Conditions". Another described the treatment of pelvic suppuration by the two-stage method without postponement or delay; it was presented before a congress of American surgeons in New York and was published in *Surgery*,

Gynecology and Obstetrics in 1925; all who adopted the methods described in these papers are unanimous regarding their value. The same remark applies to his plastic surgery which was of a very high order. A gynaecological surgeon who worked with him for many years has written that Worrall's "continual receptiveness, his obstinate thoroughness in theatre technique, his having a reason for everything he did, his thoroughness in his operative procedure, his breadth of reading, medical and otherwise", made of whatever he said something worthy of close attention. Many persons regarded him for many years as the doyen of Australian gynaecologists.

On his retirement from the active staff of Sydney Hospital in 1919, Worrall was appointed honorary consulting surgeon and held this office till the day of his death. But he served the institution in other ways. From 1911 to 1938 he represented the honorary medical staff on the Board of Directors, and from 1914 to 1938 he was chairman of the honorary medical staff. In 1936 the directors of the hospital presented him with a large picture of the hospital signed by all the directors; this was done to mark the completion of fifty years of service to the institution. The honorary medical staff at the same time presented him with a silver salver. In 1939 his portrait was hung in the board room. In 1930 the main operating theatre at Sydney Hospital was named the "Ralph Worrall Theatre" in recognition of his long service.

From the time of his arrival in Sydney Ralph Worrall took a lively interest in the affairs of the New South Wales Branch of the British Medical Association. He acted as honorary secretary in 1890 to 1901 and was President in 1890; for twenty years he was a member of the Council. His interest did not end with the duties of his several offices. He was one of those who had vision and tried to serve the future as well as the present. *The Australasian Medical Gazette* was published in New South Wales and was the property of a medical agent. Clearly the interests of the medical profession would be better served if the journal was the property of the profession. Four members of the New South Wales Branch bought the journal from its lay proprietor and presented it to the Branch. The four benefactors were George Rennie, George Fortescue, William Henry Crago and Ralph Worrall. How valuable *The Australasian Medical Gazette* was to the Branch is a matter of history. It, with *The Australian Medical Journal*, published in Melbourne, was the immediate predecessor of *THE MEDICAL JOURNAL OF AUSTRALIA*. In a sense therefore Ralph Worrall takes his place in the direct line of ancestry of our present journal. His attitude to this journal was always one of willingness to help and not long before his death he made a gift of books to the Editor's library.

The inception of the Royal Australasian College of Surgeons claimed his attention. He was a Foundation Fellow and for some years had a seat on the Council of the College. He contributed to the first number of *The Journal of the College of Surgeons of Australasia* an article on some plastic operations on the female genital tract. He was also an honorary Fellow of the American College of Surgeons and in 1924 was invited to read a paper at a congress of the College in New York. He was admitted to the degree of Doctor of Medicine of the University of Sydney *ad eundem gradum*; he acted as examiner in gynaecology and obstetrics for the M.D. degree of the University of Sydney in 1926 and in 1917 in the same subjects for the University of Adelaide.

We have shown how Ralph Worrall served the community in which he lived, how he left his mark on the hospital with which he was associated and how he made contributions to knowledge. These achievements should be an incentive and an example to younger men.

Lieutenant-Colonel Archie Aspinall writes:

The death of Dr. Ralph Worrall brings back memories to many of us who were resident medical officers at Sydney Hospital in the days of Jenkins, Fiaschi, Chisholm, Steer Bowker, Jamieson and Maitland, amongst others of the honorary medical staff. What stalwarts they were! As house surgeon to Worrall, one's first impression of him was his searching eyes, revealing an intense interest in his patients and everything connected with their welfare. It was an education to watch the care with which he wrote down his own notes before making any examination of the patient—then the systematic examination, the differential diagnosis and the final diagnosis always recorded so that at operations students could compare the pre-operative diagnosis with the actual condition found. It was seldom that Worrall's opinion was incorrect. Worrall's operating theatre was a model of simple efficiency and perfect discipline.

Outside the operating theatre sitting in the surgeons' room we were fascinated with his general knowledge of and interest in things apart from his own profession. His personal kindness, helpful advice, the charm of his home circle, and his joyful greeting of children, who loved him, too, will never be forgotten by those counted amongst his friends.

REGINALD WILLIAM HARRISON MAFFEY.

We regret to announce the death of Dr. Reginald William Harrison Maffey, which occurred on August 9, 1942, at Singleton, New South Wales.

GREGORY SPROTT.

We regret to announce the death of Dr. Gregory Sprott, which occurred on August 13, 1942, at Melbourne, Victoria.

Nominations and Elections.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Monk, Ian, M.B., 1940 (Univ. Sydney), 37, Raglan Street, Mosman.

The undermentioned have been elected members of the New South Wales Branch of the British Medical Association:

Allen, Trevor, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.
 Barder, Kenneth Rothwell, M.B., B.S., 1942 (Univ. Sydney), 53, Darling Point Road, Darling Point.
 Browne, Gordon William, M.B., B.S., 1942 (Univ. Sydney), Newcastle General Hospital, Newcastle.
 Cohen, Douglas Harry, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.
 Darvall, Anthony Roger, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.
 Ferguson, David Alexander, M.B., B.S., 1942 (Univ. Sydney), Royal North Shore Hospital, St. Leonards.
 Gibson, Edward William, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.
 Greenwell, Colin Campbell, M.B., B.S., 1938 (Univ. Sydney), Royal Australian Air Force Section, 113th Australian General Hospital, Australia.
 MacCulloch, Thomas Harington, M.B., B.S., 1942 (Univ. Sydney), Balmalm Hospital, Balmalm.
 Morrison, Ion Craig, M.B., B.S., 1942 (Univ. Sydney), Grafton District Hospital, Grafton.
 Pittar, Desmond John, M.B., B.S., 1942 (Univ. Sydney), Wallsend District Hospital, Wallsend.
 Richards, Harold Joseph, M.B., B.S., 1942 (Univ. Sydney), NX77286 Captain H. J. Richards, 16th Motor Regiment, Home Forces.
 Storey, David Maxwell, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.
 Sutton, David Harvey, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

The undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Sheppard, Mark Yeatman, M.B., B.S., 1942 (Univ. Adelaide), Royal Adelaide Hospital, Adelaide.
 Kerr, Challan Sydney, M.B., B.S., 1942 (Univ. Adelaide), B.Sc., 1934 (Univ. Springfield, United States of America), South Esplanade, Semaphore.

The undermentioned have been elected members of the South Australian Branch of the British Medical Association:

Jeffries, John Singleton, M.B., B.S., 1942 (Univ. Adelaide), 10, Giles Street, Toorak Gardens.
 Rowe, Allan Gordon, M.B., B.S., 1942 (Univ. Adelaide), 19, Brigalow Avenue, Kensington Gardens.
 Chambers, William Charles Teesdale, M.B., B.S., 1942 (Univ. Adelaide), 30, Dutton Terrace, Medindie.

Books Received.

"Australia's Alps", by Elyne Mitchell; 1942. Sydney: Angus and Robertson Limited. Crown 4to, pp. 198 with 57 illustrations. Price: 12s. 6d. net.

Diary for the Month.

AUG. 25.—New South Wales Branch, B.M.A.: Medical Politics Committee.
 AUG. 27.—New South Wales Branch, B.M.A.: Branch.
 AUG. 27.—South Australian Branch, B.M.A.: Branch.
 AUG. 28.—Queensland Branch, B.M.A.: Council.
 AUG. 28.—Tasmanian Branch, B.M.A.: Council.
 SEPT. 1.—New South Wales Branch, B.M.A.: Organization and Science Committee.
 SEPT. 2.—Western Australian Branch, B.M.A.: Council.
 SEPT. 3.—New South Wales Branch, B.M.A.: Special Groups Committee.
 SEPT. 3.—South Australian Branch, B.M.A.: Council.
 SEPT. 4.—Queensland Branch, B.M.A.: Branch—Jackson Lecture.
 SEPT. 8.—Tasmanian Branch, B.M.A.: Branch.
 SEPT. 8.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
 SEPT. 11.—Queensland Branch, B.M.A.: Council.
 SEPT. 15.—New South Wales Branch, B.M.A.: Ethics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmalm United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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